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THE GAS JOURNAL

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A Glance at the Contents—

Gas Company Meetings.

We publish to-day reports of the Annual General Meetings of the South African Lighting Association [p. 630] and of the Hong Kong and China Gas Company [p. 632].

Cookery Demonstrations at Hereford.

The Hereford Corporation Gas Department have just concluded a most successful series of cookery demonstrations which they, in conjunction with Messrs. Radiation Ltd., held in St. Peter's Church House, Hereford. [p. 617.]

Carbonized Briquettes.

In an article in to-day's issue Mr. Harald Nielsen deals with this subject, and has selected at random four typical experiments covering a wide range of possible materials. Mr. Nielsen links low-temperature plants to present gas-works undertakings, so that full benefit can be obtained from the potentialities of both. [p. 613.]

Continuous Production of Water Gas.

In a paper on this subject read at a Joint Meeting of the Institute of Fuel and the Institution of Gas Engineers, Dr. A. Thau states that the water gas produced by the continuous process he describes is considerably cheaper than that made from a high-class fuel in the normal intermittently operated water gas plant. [p. 618.]

Differential Charges for Gas.

Several pertinent questions relating to the Gas Industry were discussed at length at the Annual General Meeting of the Scottish Junior Gas Association (Eastern District), held in Edinburgh on May 16. The various questions discussed had been submitted by members some time previous to the meeting; and several leading gas engineers had been asked to give written answers. The questions related to the following subjects: Differential Charges, Gas Pressure, Unaccounted-for Gas, Valuation of Gas-Works, Showrooms, Distribution, and Gas Products. To-day we publish the reply to the first question, by Mr. James Campbell, of Dunfermline. [p. 628.]

Gas Manager Wanted.

As will be seen from our Advertisement Columns, the Audley Urban District Council are inviting application for the position of Engineer and Manager of the Gas Department. The salary offered is £175 a year, with house, coal, and light. [p. 637.]

Glover-West Installation at Leigh.

In an article reproduced from "West's Gas" to-day, the second installation of Glover-West vertical retorts in the well-known Lancashire cotton town of Leigh is described. An interesting feature of these works is that only slacks are carbonized; but in spite of this, with the "New Model" 40-in. retorts, a yield of 82·59 therms per ton has been realized, the calorific value of the gas being not less than 430 B.Th.U. [p. 616.]

Scottish District Executive Board of the N.G.C.

The Annual General Meeting of the Scottish District Executive Board of the National Gas Council of Great Britain and Ireland was held in the Central Station Hotel, Glasgow, on Thursday, May 21, when the Chairman, Sir William E. Whyte, presided. Accompanying the Chairman were Messrs. E. J. Fottrell and S. S. Ogilvie, Joint Managers of the National Gas Council, and Mr. J. W. Napier, of Alloa, Secretary and Treasurer of the Scottish District Executive Board. After the routine business had been disposed of, Mr. E. J. Fottrell addressed the meeting on the subject of methods of charge for gas. [p. 611.]

The Industrial Field.

"Every step tending towards satisfactory utilization of gas in industry, however small the present consumption may be, will inevitably lead to further development, probably through most unexpected avenues. Persistent efforts must be made now and without delay, because, as is well known, other fuels are competing and determined efforts are being made to secure the market. If we do not even attempt to secure the business, the probability is that the position will be less advantageous as time goes on."—Mr. B. J. Bell, of the Cardiff Gaslight and Coke Company, in a paper on the use of gas for trade and industrial purposes. [p. 623.]

EDITORIAL NOTES

The Gas Grid Scheme

PARLIAMENTARY Bills in connection with gas undertakings are nowadays so seldom contested to the stage at which it is necessary for decisions to be given after a fight before a Committee of either House, that much of the interest which was formerly taken by the Industry in proceedings in the Committee Rooms has been diverted. More is heard than used to be the case of agreements being reached; and it is a good thing that such should happen. So far the present session is yielding little of an exciting nature, and we have been wondering whether the promoters of the Yorkshire Gas Grid Scheme —due to come before a Private Bill Committee sitting this week—would follow the prevailing fashion by coming to terms.

If report speaks true, an agreement has at length been arrived at, as the result of prolonged negotiations. This agreement involves the withdrawal of the Bill of the South Yorkshire Gas Grid Company, Ltd., in favour of the Bill of the Sheffield Gas Company; and it is an agreement which, when brought into operation, will provide invaluable experience for the Gas Industry in general, as we hope it will furnish profit to the parties concerned. But though of major importance in connection with the scheme, this agreement does not entirely settle the matters which have been under discussion. Curiously enough, there are, we gather, still some inside gas undertakers who have not succeeded in seeing eye to eye with the Sheffield Gas Company; but possibly by the time the Company's Bill reaches its turn before the Parliamentary Committee, these inside undertakings will have arrived at an agreement with the promoters.

The Gas Stock Market

QUITE recently a correspondent drew our attention to the fact that he had noticed in the daily Press a list of eighteen Gas Companies in whose stocks there had been transactions on the previous day. For the Gas Market this represents an unusually big batch of transactions. Indeed, our correspondent remarked that he did not remember seeing such a long list on any previous day. This is interesting; but what is of far greater importance, during a time when paper fortunes have been melting like wax exposed to the summer sun, is the high levels at which business was done, particularly as regards the debentures.

This letter, for which we are grateful to our correspondent, suggested a little investigation, and we turned for enlightenment to the Gas Stock and Share List which is published in each issue of the "JOURNAL." In this list the prices and movements are given of over eighty different stocks and shares, preference and ordinary, and debentures. Comparing the list published by us on May 27, 1931, with that appearing on May 28, 1930, it was found that the cases in which prices had risen over the twelve months were very nearly three times as numerous as those exhibiting falls. It is a remarkable thing that, with the depressed conditions through which the financial world has been passing, out of 82 selected issues, no less than 59 should be higher than they were a year ago, while in only 23 instances have slight falls occurred. A list which can furnish such heartening evidence as this of soundness and vitality, at a time when encouragement is so greatly needed, is a valuable feature of the "JOURNAL," and one which readers should keep constantly in mind. We would, too, commend a study of it to those of our electrical friends who may be pinning their hopes to a gradual fade-away on the part of gas.

Note the high prices at which Gas Companies' debentures stand, and the great esteem, as shown by the quotations, in which the ordinary and preference stocks are held by investors, and reflect that all these refer to a beneficent public utility industry the early passing of which has been glibly prophesied in certain quarters for years past—and be encouraged. Make a point of it in your propaganda, and ask the electricians to assist in disseminating such informative facts, in place of some of the things about gas which many of them seem never to tire of repeating.

And another thought arises. Full consideration of the facts we have quoted might induce certain politicians to revise their ideas of the right of the Gas Industry to some of the attention which is being lavished upon electricity. The esteem in which investors throughout the country hold our long and firmly established Industry entitles it to receive that freedom which will enable it to still further justify the faith of its shareholders, who include many thousands dependent upon it for their livelihood. Why should it remain fettered?

The President's Views

AT this time, when the Institution of Gas Engineers, and the first International Gas Conference, are in session, let us all subscribe to the faith in the future of the British Gas Industry which was declared by the President, Mr. Harold E. Copp, M.Inst.C.E., in the course of a recent interview. For this faith the President was able to give convincing reasons, and some of these are reproduced below for the benefit of those in our own Industry who may desire to use them for purposes of propaganda, and of others who may be assisted by them in placing things in their proper perspective.

The British Gas Industry uses 18 million tons of coal every year, said Mr. Copp; and this demand gives steady employment to 70,000 miners before the coal reaches the gas-works. The last annual returns showed that the British gas undertakings made nearly 330,000 million c.ft. of gas. "That," the President went on, "is a big figure, yet it is not all. When the gas was produced, 12 million tons of coke were also made. As gas coke is the only important solid smokeless fuel everywhere available, it plays a big part in abolishing the smoke nuisance. Again, the British gas-works also produce over 210 million gallons of tar per annum. From this tar come road tar, creosote, dyes, disinfectants, chemicals, and perfumes. Other products, such as motor benzole and sulphate of ammonia, also come from the gas-works. It will be seen, therefore, that the Gas Industry makes the most efficient use of Britain's coal, and, with the valuable aid of the Fuel Research Board, the Industry is always seeking still more efficient methods of gas manufacture.

"Statistics prove that the Gas Industry looms large in the social and economic life of the community. For instance, it gives steady employment to 113,000 men and women. In 1911 the number of gas consumers in the British Isles was 6,500,000. The 1931 figure reached 10,000,000! And these consumers receive their gas, year in, year out, without one breakdown to upset domestic arrangements or factory production.

"A recent survey of some of the public lighting in this country showed that, in 318 cities and towns, 13,341 (80 p.ct.) of a total of 16,559 miles of streets are lighted by gas, and that in 293 cities and towns there are 378,434 gas lamps (74 p.ct.) in use, out of a total of 514,401 street lamps. We can point to some of the finest street lighting by gas in the world in Regent Street, Pall Mall, Whitehall, Piccadilly, and Queen Victoria Street in London; and in the Provinces, Birmingham, Scarborough, and Margate provide further examples.

"Financially the Gas Industry is sound. Some £200,000,000 of British money is invested in it, and the Industry will continue to offer great attractions to the investor. Its steady development and expansion has been maintained over a very long period, and has not suffered adversely through the more recent expansion in the electricity industry, which has been stimulated by an enormous influx of capital.

"The Prince of Wales has urged British manufacturers to fight for overseas trade. I can assure you," said Mr. Copp, "that the Gas Industry is doing its share. Behind the scenes research is constantly carried out to

improve gas furnaces and general gas appliances, which will help the industrialists to lower production costs and overheads. We know that only in this way can British manufacturers hope to produce goods of the famous British quality at a competitive price. It is remarkable," he concluded, " how rapid has been the increase in the consumption of gas for industrial purposes in the last few years, and, with the steady improvement in industrial gas appliances, we can confidently expect this consumption to grow still more rapidly, even though oil and electricity are bidding strenuously for the industrial load."

Continuous Water Gas Production

A process of extraordinary interest was described last month by Dr. A. Thau at a joint meeting of the Institute of Fuel and the Institution of Gas Engineers. This process, which is due to Dr. Oswald Heller, is the continuous production of water gas from powdered fuel; and though the plant is in its very early stages, it appears to hold sure promise for the utilization of certain non-caking coals and, in particular, brown coal coke, which is a highly reactive fuel. From many points of view a continuous method of operation is an ideal to be aimed at, the greatest advantage, of course, being control of the reactions and hence uniformity in composition of the water gas produced. At present Dr. Heller's plant does not show a thermal efficiency greater than the blow-and-run process, but it is admittedly experimental; and in the new type of commercial installation suggested the efficiency may be better.

The water gas producer is of horizontal cylindrical shape divided into a number of heating and reaction cells in alternative succession. The heating cells are arranged for the combustion of producer gas, and powdered fuel from one place on the periphery and superheated steam from seven places on the periphery are blown tangentially into the reaction cells, so that during the passage through these water gas is formed. Dr. Thau maintains that the plant is adaptable to all purposes for which water gas is used, for the composition of the water gas can be varied within wide limits. In gas-works practice, carburetting may be effected; and, states the author, " without intending to suggest that the producer will replace a whole gas-works, there is no doubt that the possibilities of its application and its adaptability for the various kinds of fuel available, or to the quality of gas to be desired, goes far beyond the normal water gas process as generally applied so far."

We should imagine that the process will likely find favour in America rather than in England, as far as gas undertakings are concerned, for in the United States bituminous coal is employed to a large extent for water gas production. In England, however, one of the main reasons why the water gas process is adopted is that it enables gas undertakings to have a measure of control over the coke market. As Mr. H. Hollings pointed out in the discussion, if the process was adopted in gas-works there would still be the necessity of making a producer gas from coke; and he believes that many English engineers would feel that it was still desirable to use lump coke for that purpose. He also called attention to the fact that, on the basis of gas volumes, the producer gas plant—which is a necessary auxiliary to the continuous plant—became even larger than the water gas plant itself.

Dr. Lessing made a very interesting contribution to the discussion. His idea is this: Natural coal dust, such as that obtained in the air elutriation stage of his process of cleaning coal, is admirably adapted for use in the continuous water gas plant, and it would cut out the costs of powdering. It is non-agglutinating, and has not the disadvantage of the low degree of reactivity of powdered coke, if in fact the latter could be used. The material is potentially available in enormous quantities. If, therefore, the Gas Industry wishes to retain its hold on the coke market, and feels compelled to use coke for water gas production, why not combine the two processes by employing the coal dust, which would otherwise go into the coke and swell the tonnage, in the continuous plant and at the same time carry on with the intermittent method. This scheme, he pointed out, would be a natural corollary to another problem—the cleaning of coal generally. In connection with the preparation of balance-sheets to show the economic significance of this operation, upon the carbonization process in gas-works, the disposal of the dust would be a difficult matter at a gas-works. But the continuous water gas process might help to solve this problem. Moreover, although the ordinary intermittent water gas process, if carried out on modern lines, is highly efficient thermally, the efficiency of the process could be still further increased to a very great extent by the use of a low ash coke. An extract from Dr. Thau's important paper, and a report of the valuable discussion, will be found in this issue of the " Journal."

One Thing Leads to Another

The fact that a gas undertaking is not in an " industrial area " offers no excuse for such an undertaking failing to explore the possibilities of the application of gas to trade and industrial purposes. In the " Journal " for May 6 Mr. J. E. White, of Newcastle, made an excellent statement of the industrial possibilities of the small gas concern. The Newcastle Company is, of course, in a particularly happy position in regard to the application of gas to large-scale heat-treatment work; but it supplies gas over a wide area. And Mr. White referred to, among other possibilities, the wayside garage and petrol filling station as being full of potential uses for gas, and quoted an actual example on the boundary of his Company's area. In this case gas generates electricity, and is employed for air compression, soldering, and brazing; and, as the ground at the rear of the garage has been laid out for motorists touring with caravan trailers, gas is the agent for cooking and water heating. We mention this example as being typical of what can be accomplished by any gas undertaking, irrespective of size, if it is prepared to seize its opportunities.

The foregoing qualification is exceedingly important, and it is the keynote of a paper by Mr. B. J. Bell, of the Cardiff Gas Light and Coke Company, printed in our issue to-day. The paper was read before the Wales and Monmouthshire Association. The author asks that those responsible for the welfare of small gas undertakings shall become neither dazzled by tales of industrial consumptions reckoned in millions a day, nor despondent about the seeming lack of opportunity in their own areas. One thing leads to another, and there is no reason for a negative attitude in even what Mr. Bell terms " zero " areas—" zero " only because the trade outlets for gas have not been realized. And there is only one way to gain this information—by a careful survey—and, having ascertained where activity is likely to be repaid, only one way to obtain the business—by a canvass. As Mr. Bell says, only long and arduous cultivation of probable consumers and their requirements will prove productive, and much unremunerative and disappointing experimental and demonstration work has to be undertaken before commercial success can be expected. Yet, " every step tending towards satisfactory utilization of gas in industry, however small the present consumption may be, will inevitably lead to future development, probably through most unexpected avenues."

The moral of all this, of course, is to have faith in the outcome of persistent effort to interest small industrialists and small traders in the application of gas. Regarding this power to interest possible users, there is one very important point to bear in mind—that there is a quarter of a century's experience and specialization behind successful industrial gas loads, and that this experience is available to every undertaking. For years we have consistently emphasized the need for co-operation in tackling the industrial field—the need not only for pooling resources, but for drawing upon them. And the new scheme of the National Gas Council provides a means whereby all undertakings will be able to avail themselves of the pooled experience of the use of gas for industrial purposes. The country is to be divided into districts, and in each there will be a centre which will act as a source of information and which will arrange for the visits of a specialist in this class of work. One of these

centres is Cardiff, where already an industrial showroom and laboratory have been equipped. And, as indicating the virtue of such premises, the space originally allocated has proved to be inadequate, and extensions are in hand. The resources are being built up throughout the country; and it is the urgent duty of all undertakings to make full use of them. The scheme will bear its best fruit if there is co-operation not only between district undertakings and their industrial centres, but also between the industrial centres themselves. A unifying influence, to prevent overlapping of research and unnecessary detail work, is not merely desirable, but essential. Duplication or triplication of work on the same industrial problem by different concerns may theoretically and domestically be interesting, and may provide ample material for technical discussion and for argument as to who was, and who was not, pioneer; but from the viewpoint of the Industry it is largely waste of time.

Mr. Bell emphasizes the desirability of employing trained representatives as industrial salesmen, and in this connection maintains that there is a distinct opening in our Industry for young men possessing good technical knowledge combined with workshop practice—a view with which we thoroughly agree. His opinion is based on experience with a Company which is making a determined effort to secure the industrial load for gas—an experience which enables him to refer to some recent highly interesting applications which the Company have been called upon to investigate. These examples, which are very different in nature, indicate the versatility of gas as an industrial fuel, and show that there is nothing stereotyped about the industrial load. They demonstrate, too, that the policy of building-up a substantial load by attention to small outlets for gas is essentially a right one. Eventually the bigger loads come along, and can be handled with certainty.

Can We Afford It

TIMES are bad, and there must be the fullest sympathy with those who are unable to find employment. This sympathy must be practical within economic bounds; for pious expressions of regret will do nothing to fill empty larders. It is the abuse, and not the use, of material aid that is causing a lot of misgiving at the present moment. There are obvious undesirable features attached to existing methods of distributing unemployed benefit, and people are wondering what is going to be done about the matter. The Commission appointed to investigate and submit recommendations will in all probability soon be issuing their report; and they may furnish illustrations of abuses. If so, we wonder whether they will include anything to beat the following examples of marriage on out-relief, which were cut from a newspaper a few days ago:

> The annual report of the Newcastle Public Assistance Committee states that during the nine months ended Dec. 31, 73 men married while in receipt of out-relief, 40 men applied for out-relief within one week of marriage, 54 men within one month, 39 men within three months, and 30 men within six months. The total number of unemployed married men now in receipt of relief from the Committee is 1075. Of that number 150 are known to have married on the rates, and they are responsible for adding 295 children to the chargeable list.
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> The report says that men recently married without means, in certain instances without ever having been employed since leaving school, usually assert: "The Guardians will have to keep us." Young people in receipt of out-relief and resident with their parents have married and immediately applied for increased scales on the basis of their changed circumstances. Instances of people who have never worked in wage-earning employment are included in the report.

At the moment that such a state of affairs as this is revealed, we find Sir Felix J. C. Pole expressing the conviction that no country can prosper under high permanent taxation. Here, then, would seem to be the answer to the question: "Can we afford it?" Should any further be required, let us turn to Mr. Henry Morgan, who, in his Presidential Speech to the Society of Incorporated Accountants and Auditors, said, referring to the outlook for this country when the world depression lifts: "Superiority in manufacturing skill and efficiency—a superiority which is rapidly shrinking—cannot possibly overcome the crippling burden with which our industries are saddled in comparison with our foreign competitors." These and similar authoritative pronouncements may well be borne in mind when the Government have to consider the report of the Commission already alluded to. It will be well also to remember the declaration made by the National Council of Industry and Commerce, warning the nation of the grave danger of an economic and industrial collapse, and affirming its determination to take "whatever steps may be necessary to assist in averting impending disaster." This warning recalls the remarks which Mr. Frank Prentice addressed to gas undertakings while speaking at the recent meeting of the Eastern Counties Gas Managers' Association—see "JOURNAL," May 20, p. 498.

De-Rating of Public Utility Undertakings

IT is understood that the Stepney Metropolitan Borough Council have addressed a communication to the St. Marylebone Borough Council Electricity Supply Committee urging that electricity undertakings should be brought within the scope of the Rating and Valuation (Apportionment) Act, 1928, and thus participate in the benefits of "de-rating." The view is expressed that the disability under which such undertakings labour, in comparison with other undertakings to which the Act grants relief, is inequitable.

The Metropolitan Boroughs' Joint Standing Committee have been requested to consider the matter, with a view to securing the extension of the 1928 Act to include premises occupied by, and used for the purposes of, a public supply undertaking, which are specifically excluded from the provisions of the Act.

It will be remembered that a similar claim has been urged on behalf of the Gas Industry, and the question was considered in the "JOURNAL" for April 1. We are accordingly gratified to learn that another large public utility industry is keenly interested in obtaining an amendment to Section 3 of the Act, to enable electricity, gas, and other public utilities to receive a measure of relief from their present rating burdens. While immediate action on the part of the Government is not to be expected in the present financial condition of the National Exchequer, it is felt that a good case has been made out for the remedying of an obvious injustice to those industries concerned with the supply of gas, water, and electricity—undertakings which constitute some of the largest ratepayers in the country.

Forthcoming Engagements.

June 11.—WALES AND MONMOUTHSHIRE JUNIORS.—Summer visit to Messrs. Stewarts & Lloyds, Coombs Wood Works, Halesowen, near Birmingham.

June 13.—NORTH OF ENGLAND ASSOCIATION (AUXILIARY SECTION).—Twenty-Second Half-Yearly Meeting in Newcastle.

June 20.—LONDON AND SOUTHERN DISTRICT JUNIORS.—Summer visit to Isle of Thanet Gas Light and Coke Company, Margate.

June 24.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of Executive Committee at 11.30 a.m.

June 25.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council Meeting.

June 26.—WAVERLEY ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Edinburgh.

June 30.—NATIONAL GAS COUNCIL.—Thirteenth Annual General Meeting.

June 30.—FEDERATION OF GAS EMPLOYERS.—Annual Meeting.

Sept. 10.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Rothesay.

Sept. 28-30.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Conference at Exeter.

Oct. 27-28.—INSTITUTION OF GAS ENGINEERS.—Autumnal Research Meeting.

PERSONAL

KNIGHTHOOD FOR WELL-KNOWN GAS ENGINEER.

At the moment of going to Press we are gratified to see that among the names in the list of honours, conferred upon the occasion of the King's 66th birthday, appears that of JOHN FERGUSON BELL, M.Inst.C.E., M.I.Mech.E., J.P., Engineer, General Manager, and Director of the Derby Gas Light and Coke Company, and lately Mayor of Derby, who receives the honour of knighthood for public services in Derby.

THE A.G.A. PRESIDENT.

The Court Journal last Saturday recorded the fact that the previous day Mr. CLIFFORD E. PAIGE, the President of the American Gas Association, was received by H.R.H. The Prince of Wales at St. James's Palace (when, we understand, he had half-an-hour's most interesting conversation), and "The Times" for June 2 reports the fact that Mr. Paige was among those attending the Levée held by H.M. The King on Monday. We are very glad that the Gas Industry, in the United States and in this country, should have been thus honoured through, as to the one, their representative, and, as to the other, their distinguished guest. Mr. Paige was also present at the luncheon given by the Pilgrims Society last Friday to the presidents of the Carnegie Trust and Foundation now visiting this country.

The retirement has taken place of Mr. W. LOCKEY, who has won general esteem in Alnwick where he has been for 29 years Manager of the Alnwick Gas Company's works. During his managership, the gas-works have been considerably extended and improved, and the lighting facilities of the town have been largely increased.

In response to the recent advertisement in the "JOURNAL" for the position of Assistant Engineer to the Elland-cum-Greetland Gas Company, 105 applications have been received. Mr. ALAN W. ELLIOTT, Chief Technical Assistant to the Shrewsbury Gas Light Company, has been selected for the position, and commences his duties towards the end of the month.

At a Meeting of the Directors of the Ilfracombe Gas Company on May 27, Mr. JAMES W. PYE, Technical Assistant Engineer to the Plymouth Gas Company, was appointed Assistant Engineer and Manager to the Ilfracombe Company. He is taking the place of Mr. W. Turnbull, who has been appointed Engineer and Manager of the Alnwick Gas Company.

CORRESPONDENCE

Tar Oil Research

SIR,—The Gas Industry must welcome the announcement made in the House of Commons recently in which it was stated that a small commercial scale plant was to be erected at the Fuel Research Station for the hydrogenation of tar oils. The information was given in a statement which dealt with low-temperature carbonization, but it is to be presumed that the plant referred to will experiment with tar or oil produced from coal by carbonization at any temperature.

Government assistance on these lines is a definite step forward in the right direction—much valuable information will be obtained; and it can be safely stated that no private enterprise will be thus subjected to State-aided competition.

The official announcement is all the more welcome at a time when many rumours have been in circulation, both in the House of Commons and elsewhere, to the effect that the Government were about to embark on an elaborate and expensive experiment in connection with the direct hydrogenation of solid coal. If such rumours had materialized, then a retrograde step would have been taken.

The primary products from the carbonization of coal at either high or low temperatures are gas and coke. Tar oil is produced in each case as a bye-product, the quantity and quality varying according to the type of process employed. Preliminary experiments at the official Fuel Research Station have demonstrated that both creosote and low-temperature coal oils are suitable raw material for the hydrogenation process.

Sir H. McGowan, writing in "The Times" of May 22, has stated that the hydrogenation of solid coal can now be undertaken "provided the development be initiated as a National enterprise." It is to be assumed that this latter sentence can be interpreted as meaning "provided a grant from the public funds is forthcoming."

If public money is to be voted for the purpose of developing this invention, it should be spent on a plant to hydrogenate tar oils and not solid coal, if only for the reason that the technique of the former is far simpler.

By a favourable process of carbonization a yield of 18 gallons of tar oil per ton of coal treated can be obtained. It is obvious that if a State-subsidized hydrogenation plant, with a throughput of 1000 tons of coal per day, were constructed, an additional 365,000 tons of coal per annum would be mined in order to provide the raw material.

If such a plant were designed to deal with tar oils, however, an extra quantity of not less than 4,460,000 tons of coal per annum would be required from our distressed coalfields. It is to be assumed that the Government interest in this new invention is primarily intended to stimulate the demand for coal.

By concentrating on the hydrogenation of tar oil, as opposed to the hydrogenation of solid coal, the official Fuel Research Board will be attacking a technically simpler and less expensive problem, and will in addition develop a process which will result in the raising of at least twelve times the quantity of coal.

COLIN BUIST,
Hon. Secretary.

Low-Temperature Coal Distillers' Association of Great Britain, Ltd.,
May 27, 1931.

THE NEWS OF THE WEEK

The Societe du Gaz de Paris reports a net profit of £87,245 for the last financial year, compared with £89,640 in 1929.

The Malta and Mediterranean Gas Company, Ltd., show an amount standing to the credit of profit and loss account of £26,799 for the year ended March 31 last. The Directors propose the payment of the dividends on the first and second preference capital, and a dividend of 5 p.ct. (free of income-tax) on the ordinary capital, making, with the interim dividend paid in December last, 10 p.ct. for the year, and leaving a balance of £21,322 to be carried forward.

The Output of Gas in Spain during last year is estimated to have amounted to 4659 million c.ft. The consumption of coal by the gas-works of the country is given as 367,839 tons of Spanish and 26,980 tons of imported coal.

A Dangerous Outbreak of Fire at the Christchurch (New Zealand) Gas Company's Moorhouse Avenue Works recently was confined to the tar bye-products plant, and brought under control after two hours. The explosions and bursting of great drums of oil made the fire spectacular in its early stages, but thereafter there was little to be seen but a dense volume of black smoke. Coke and ashes, as well as water, were used to overcome the flames.

THE NEWS—*continued.*

Successful Gas Exhibitions and cookery demonstrations have been held for a week each at Rawtenstall, Bacup, and Waterfoot under the auspices of the Rossendale Union Gas Company.

The Haslingden Union Gas Company are seeking permission from the Accrington Corporation to lay a 6-in. steel gas main in connection with a proposal to purchase coke oven gas from the Lancashire Foundry Coke Company's works at Altham.

The Municipal Authorities of Liege are inviting tenders, until June 13, for the supply of 200 20-light wet gas meters. Tenders are to be sent to the Bureau des Fiances et des Services Industriels de la Ville de Liege, whence particulars may be obtained for 2 francs.

Hungary's Gas Production.—A recent official return shows that the ten gas undertakings in Hungary last year registered a total gas output of 3774 million c.ft., a fractional advance over 1929. The chief works are those in the capital city, Budapest, where the output reached 3415 million c.ft., or about 90 p.ct. of the country's total.

By the Kind Invitation of the Davis Gas Stove Company, the staff of the Distribution Department of the Bedford District Gas Company visited the Diamond Foundry, Luton, and were conducted throughout the large extent of these modern and up-to-date works, where gas cookers, gas fires, and other appliances were seen in the making. A very interesting and instructive afternoon was spent, and the parties were afterwards entertained at tea in the fine dining hall adjoining the foundry.

A Special Number has just been issued of the "Zeitschrift des Oesterreichischen Vereines von Gas- und Wasserfachmännern," of Vienna, to mark the completion of the first fifty years' existence of the Association of Austrian Gas and Water Engineers. Among the special articles are one on "The Austrian Gas Industry and Austrian Coal," by Ing. F. Bössner, Vienna; one on "The Establishment and Development of the Austrian Gas Industry," by Ing. Karl Sprinzl, Vienna; and one on "Development Tendencies in the Gas Industry," by Herr H. Miller, Hamburg.

Meters, Ltd., Manchester, show a net profit for the year ended March 31, 1931, of £17,340, which added to the balance of £5898 brought forward, gives a total of £23,239. After deducting the interim dividends amounting to £6669 paid in November last, the amount now available for appropriation is £16,569. The Directors recommend the following: (*a*) The payment of final dividends for the year ended March 31, 1931, of 2¾ p.ct. (actual) upon the preference shares, and of 6½ p.ct. (actual) upon the ordinary shares, making the total dividends for the year 5½ p.ct. upon the preference shares and 9 p.ct. upon the ordinary shares (both less income-tax); and (*b*) that the balance of £3702 be carried forward to next year's accounts.

Liverpool's Gas Supply.

With the issue of the "Liverpool Daily Post" for June 1 was published a supplement entitled "The Ambassador of Merseyside's Industry and Commerce," in which there was an interesting article on the subject of "Liverpool's Gas Supply" from the earliest times.

About the end of 1815, it was stated, Mr. Jonathan Varty, a Dale Street coach-builder, erected a small gas plant on his premises, laid pipes under the street, and for a short period the front of the Town Hall was brilliantly illuminated by two large gas lamps of three burners each. In 1818, the Liverpool Gas Light Company, with an authorized capital of £50,000, was incorporated, and works and offices were set up on the site now occupied by the Police Buildings at the corner of Dale Street and Hatton Garden. Four years later a rival company, latterly called the Liverpool New Gas and Coke Company, erected works at Rose Hill, curiously enough, on a site now occupied by another police building. Obviously, it was very inconvenient for the town to have competing gas undertakings, and so in 1848 the two wisely amalgamated under the name of the Liverpool United Gas Light Company. New offices were built in Newington, and remained the Headquarters of the Company until 1870, when the site was acquired by the Cheshire Lines Committee for the purpose of building the Central Staton. The Cheshire Lines Committee provided handsome new premises in Duke Street, and these, with extensions from time to time to cope with the ever-increasing volume of business, have provided the necessary office accommodation ever since 1872.

The article goes on to trace the growth and development of the Company and the opening of the various works in different parts of the city.

The growth and magnitude of the Company's operations are indicated by the facts that it has a capital of £3,867,831 and that it uses annually in the manufacture of gas no less than 369,000 tons of coal, 4,334,100 gallons of gas oil, and 36,903 tons of coke.

In 1830, the Company manufactured 71,312,000 c.ft., as compared with 8,073,792,400 c.ft. in 1929. In a recent week the Linacre works alone made almost as much gas as the Company's total annual output a hundred years ago.

In Defence of Gas.

A recent allegation by a Bradford City Councillor—during the street lighting controversy—that giving the lighting work to the Gas Department was merely trying to keep alive a dying industry, has led the Bradford Gas Committee to issue a lengthy circular letter to every member of the Council. The letter is signed by the Chairman (Alderman G. Walker) and the Deputy Chairman (Councillor F. J. Cowie), and comments on the widespread misconception in the popular mind that the expansion of electrical activity has been, and must continue to be, accompanied by a decline in the use of gas. The facts, as set out by the letter, are shown to be entirely contrary to this supposition.

The letter went on to draw attention to the continuous vigorous increase in the use of gas, and, continued the letter, "given fair competition, there is no reason to fear that it will eventually be displaced from the position which it now holds."

The Gas Committee at Bradford told their fellow Councillors that they see in the present campaign to popularize electricity a source of undeserved, but none the less serious, damage to the Gas Industry, and in order that members of Bradford City Council may familiarize themselves with the true position, they quoted statistics showing not only how great an expansion there has been in the use of gas coincident with the development of electricity, but that there is ample scope for further increase.

Third International Conference on Bituminous Coal.

England will be represented by an outstanding group of scientists and men of affairs at the Third International Conference on Bituminous Coal which will be held at the Carnegie Institute of Technology in Pittsburgh, Pa., U.S.A., Nov. 16 to 21, 1931.

Prof. William A. Bone, of the Imperial College of Science and Technology, London; Dr. Cecil Lander, Director of the Fuel Research Board, London; Dr. R. Lessing, Consulting Chemist, of London; and Dr. W. H. Cadman, of the Anglo-Persian Oil Company, London, are among the group that have accepted the invitation of Dr. Thomas S. Baker, President of the Carnegie Institute of Technology and organizer of the Conferences, to participate in the international meeting next autumn.

Other English fuel technologists who will either attend the congress in person or contribute papers are: Dr. M. Barash, of West's Gas Improvement Company, Manchester; Mr. Geoffrey M. Gill, Consulting Engineer, London; Mr. J. Ivon Graham, Deputy Director, Mining Research Laboratory, the Birmingham University; Dr. E. S. Grumell, Imperial Chemical Industries, Ltd., Northwick; Prof. H. G. A. Hickling, Dept. of Geology, University of Durham, Newcastle-upon-Tyne; Mr. Harald Nielsen, Consulting Engineer, London; Mr. P. C. Pope, Secretary of the Institute of Fuel, London; Mr. N. E. Rambush, General Manager, Power-Gas Corporation, Stockton-on-Tees; and Dr. F. S. Sinnatt, Assistant Director, Fuel Research Board, London.

France and Germany will also be represented by impressive delegations at the Pittsburgh meeting. Profs. Mailhe and Camille Matignon, of the Sorbonne, and M. Andre Kling, Director of the Municipal Laboratory of Paris, will contribute papers or attend the meeting.

From Germany will come Dr. Friedrich Bergius, Prof. Dr. Franz Fischer, and Prof. Dr. Ernst Berl. Twelve other German scientists have already accepted Dr. Baker's invitation to participate in the coal meeting. Austria, Belgium, Holland, Poland, Spain, and Switzerland also will have representatives at the meeting.

In America, the best scientific minds have been secured to take part in the meetings. The tentative programme shows that the economic side of the coal industry will be emphasized. The competition between natural gas, water, coal, and petroleum as sources of power will be one of the chief topics of discussion. Carbonization, gasification, and liquefaction of coal, and new methods of utilization will also be discussed by authorities in the several fields.

A prominent group of American men of affairs will assist Dr. Baker in the organization and administration of the conference.

Scottish District Executive Board of the N.G.C.

DISCUSSION ON METHODS OF CHARGE FOR GAS

The Annual General Meeting of the Scottish District Executive Board of the National Gas Council of Great Britain and Ireland was held in the Central Station Hotel, Glasgow, on Thursday, May 21, when the Chairman, Sir WILLIAM E. WHYTE, presided.

Accompanying the Chairman were Messrs. E. J. Fottrell and S. S. Ogilvie, Joint Managers of the National Gas Council, and Mr. J. W. Napier, of Alloa, Secretary and Treasurer of the Scottish District Executive Board.

The CHAIRMAN, in the course of a few introductory remarks, said it would be a matter of pleasure to all present to know that matters were definitely moving in the direction of securing amending and new legislation for the needs of the Gas Industry. He was sure they all wished every success for the inquiry that had been set up; and he hoped the outcome of the inquiry would be the removal of an anomaly of the worst possible kind. In the annual report of the Scottish Executive Board there was a reference to probable legislation for public utility undertakings, and he believed there was a Bill in the Scottish Office dealing with that subject. Nothing definite, he supposed, could be promised with regard to the actual presentation of the Bill to the House of Commons, but he believed there was a fair prospect that the measure would be submitted to the House in the near future. As representing the gas undertakings of Scotland they, as an Executive Board, could not do other than press for the promotion of this Bill, so that they might know exactly what the Government had to offer to public utility undertakings in the future. To his mind it served little purpose for committees representative of gas undertakings to prepare a great deal of valuable information on suggested reforms when it was found that the data so presented could not receive much attention for the reason that the Government had reached definite findings and ideas regarding what should be done in the sphere of public utility work. It seemed to him that their policy was to get the Scottish Office to press forward with this measure.

After the routine business had been disposed of, the Chairman called upon Mr. E. J. Fottrell to address the meeting on the subject of

METHODS OF CHARGE FOR GAS.

Mr. Fottrell said he felt there was no subject of greater importance to the Industry at the present time than this question of charges. The position in which they of the Industry found themselves to-day was not one of their own making. They all knew that gas supply was essentially a continuous service, and not merely the sale of a commodity. Parliament, however, had always fixed permissible charges for gas in a form which ignored the continuous nature of the service, and treated gas undertakings as purveyors of a commodity. It was well to bear in mind that the manufacturer of a commodity—for example, boots or tobacco—manufactured his products for a definite daily output. He maintained that output at a uniform rate over a predetermined number of hours. He arranged distribution in the most economic quantities to suitable centres which he himself selected, and the purchaser collected his requirements from the retailer between specified hours and within the limits of the retailer's stock.

The purveyor of a continuous service, such as gas, had, on the other hand, to install plant equal in capacity to the probable maximum daily demand of his customers. He must be prepared to extend that plant in anticipation of an increased demand, but could only operate it in accordance with the fluctuating seasonal demand of his customers. He must be prepared at any moment of the day or night to meet the aggregate requirements of his customers, and to deliver the commodity to their premises. The essential difference between these two cases was that the manufacturer could himself determine the cost of the article he produced, which was practically a constant cost or was, at any rate, independent of variations in demand, whereas the users of the public service themselves determined, as a body, the cost of rendering the service. It would be evident, therefore, that while a uniform charge per article was logical and fair in the former case, it was quite illogical and might be grossly unfair in the latter.

Passing on to deal with proposals for a more rational method of charging for gas, Mr. Fottrell pointed out that the commodity cost in the case of gas might be only 25 p.ct. of the total expense in maintaining the supply. That portion alone was, strictly speaking, within the control of the undertaking. The balance of cost was determined by the nature of the requirements of individual customers or of groups of customers. It was evident, therefore, that a rational charge for gas supply would take into consideration not merely the quantity consumed—as at present—but the circumstances in which that supply was demanded. An analysis would show how the fluctuating daily and hourly demands affected the costs and called for the provision of manufacturing plant and mains greatly in excess of what was required to meet an unvarying demand. The problem of how to determine a rational charge for gas was the problem of how to allocate the capital and working costs incurred in consequence of that excess plant. The ideal rate of charge was one which took into consideration the actual costs which any particular consumer imposed upon the undertaking; and a close approximation to such a rate could be obtained. It would be found, however, that such a rate would increase the existing bills of perhaps 60 to 70 p.ct. of the consumers.

INCREASE OF UNREMUNERATIVE CONSUMERS.

This discovery was apt to deter undertakings from improving their present form of rate. Such a tendency should be strongly resisted, because the longer a change of method was deferred the more difficult would it be to make the change. Due to the new forms of competition —namely, fuel oil and electricity—the number of unremunerative customers was bound to become greater as time went on. To his mind there was an even stronger argument than that against delay—so long as they expected 30 to 40 p.ct. of their consumers to finance to a greater or less extent the remainder, so long should they fail to extend the sphere of usefulness of gas and to enlarge the scale of their operations.

Discussing the first steps towards an improved method of charging, Mr. Fottrell said that the following suggestions were made with a view to eliciting discussion, but each individual case probably called for its special remedy: (1) The introduction of meter rents where such were not at present in force; (2) an increase in the rate now charged for the initial quantity of gas consumed; (3) a higher flat rate coupled with an optional two-part tariff; and (4) a higher flat rate coupled with an optional block rate. Mr. Fottrell briefly outlined the inherent merit of the foregoing methods of charging, and again emphasized the importance of each undertaking fixing on the particular line of charging that seemed most suitable to its local needs. He believed he was correct in saying that, so far as Scotland was concerned, they had not made much headway with the two-part tariff, but some progress had been effected with the block system. He had been interested to hear of the proposals which Mr. J. W. McLusky, of Glasgow, had put forward. It would, he thought, be helpful if the other gentlemen present would indicate the manner in which they were proposing to approach the subject of charging for gas, so as to arrive at something more rational than the one in force.

The SECRETARY explained that he had received from Mr. J. W. McLusky—who was unfortunately indisposed and unable to attend the meeting—a communication in which he outlined the scheme that had been approved by the Gas Committee in Glasgow and by the City Corporation. The statement showed that the whole of the domestic consumers' accounts for the year ended May 31, 1930, had been analyzed, and the average consumption per quarter or per annum in all sizes of houses within the area of supply was now established knowledge. The details were as follows:

No. of Rooms.	Ordinary Meters per Annum.	Prepayment Meters per Annum.
	C.Ft.	C.Ft.
1	11,413	16,244
2	16,480	22,022
3	20,070	26,417
4	24,452	30,366
5	29,357	..
6	35,456	..
Over 6	51,757	..

It would be noticed—the statement went on to explain—that the average consumption rose fairly regularly as the opportunity for consumption was increased by the addition of rooms to a house. The capital charges incurred in giving a supply to any size of house was approximately the same. A slight difference occurred owing to larger meters being required where larger consumptions were to be registered, but that difference

was almost negligible. The proposal included the abolition of supplementary districts where it had been the practice of the Gas Department to charge higher rates for gas. These higher charges were imposed by the gas undertaking in order to recover extra outlay in supplying thinly populated districts outside the city boundary. Now that these abnormal outlays had been recovered in gas collections, it was proposed to put the whole area of supply on one basis for charging. Having ascertained the average consumption of all particular types of houses, it was felt that it would not be unfair to ask each particular domestic consumer to bring their consumption up to the average before qualifying for a rebate in price. Therefore a standard consumption per house per quarter had been set, and this had been based upon the present average consumption as would be seen from the following suggested scale:

No. of Rooms.	Ordinary Meters.		Prepayment Meters.	
	Present Average per Annum.	Suggested Scale per Quarter.	Present Average per Annum.	Suggested Scale per Quarter.
	C.Ft.	C.Ft.	C.Ft.	C.Ft.
1	11,413	3000	16,244	2000
2	16,480	4000	22,022	2700
3	20,070	5000	26,417	3500
4	24,452	6000	30,366	4000
5	29,357	8000	..	..
6	35,456	8000	..	..
Over 6	51,757	8000	..	..

The classification into various sizes of houses had been made on the basis usually followed by house factors when describing property. A feature in the suggested scheme was that the standard consumption had been calculated at per quarter in the case of ordinary meters and at per coin collection in the case of prepayment meters. Thus each separate transaction would be complete without any retrospective calculations being necessary. The proposals therefore were: (1) Customers who have consumed the standard quantity and thereby contributed their just proportion of standing charges shall receive an immediate advantage in price for all gas consumed in excess of the standard quantity. (2) It should naturally follow that consumers would be encouraged to extend their use of gas, seeing that such extension would be supplied at the reduced rate. Until, however, the Gas Committee was in a position to consider definite financial results of the present year's working, it was inadvisable to state the amount of the suggested rebate for quantities consumed over the standard.

Mr. James Campbell, of Dunfermline, said they were indebted to Mr. Fottrell for bringing this subject to their notice; and if any justification was needed for its prompt consideration, then it was to be found in the following extract from a recent speech by Mr. Frank Hodges, a member of the Central Electricity Board, at the meeting held in Glasgow: "The stage had now been reached when it was possible for the Central Board to work out a tariff for the whole of Central Scotland, and negotiations with authorized undertakings in connection with this tariff are already far advanced. In a short time, therefore, the grid, as it applies to Central Scotland, will be complete, even to the definition of a tariff for the area. That means that the Board, and authorized undertakers deriving electricity from it, will be in a position to supply electricity at an economic rate."

Dunfermline Adopts New System.

In Dunfermline, they had that week inaugurated a block system of charges. Apart from the question of competition, two factors weighed with them in recommending a change; and these were: (1) The difficulty in deciding whether certain consumers were industrial or domestic; and (2) the anomaly of charging the full rate to large industrial consumers while charging industrial consumers at a much reduced rate although they might be using only the same or even a much less quantity of gas. Some months ago, the owner of a fairly large house, in an endeavour to save domestic labour, asked him (the speaker) to give an approximate running cost for the use of gas in cooking, heating, and hot water supplies. Investigation showed that this would amount to about 1000 c.ft. per day or—allowing for holidays, &c.—about 300,000 c.ft. per annum. According to the then existing charges, they could only charge that owner the ordinary domestic rate of 3s. 2d. per 1000 c.ft., while, at the same time, an industrial consumer using the same amount of gas would have been charged 2s. 2d. per 1000 c.ft. When he was asked to justify the difference in price, he (Mr. Campbell) frankly could not. Indeed, if he had been able to offer the domestic consumer the industrial rate, the order would have been given at once, but, as it was, the order was lost. He firmly believed that under a proper system of charge there was a very large field for extra domestic consumption, especially for room heating and hot water supplies. The question then arose—Should the new method of charge be a two-part tariff, consisting of a service charge and a low price for the gas used, or should a charge be made on the principle of the block system? In the case of Dunfermline, he had an analysis made of the accounts for the year ended May, 1930, based on the recommendations of the National Gas Council's Committee on Gas Charges, and he found that the service charge in Dunfermline would amount to 34s. 8d. per consumer per annum, *plus* 1s. 10½d. per 1000 c.ft. for all gas used. He was still, however, faced with the fact that they had between 2000 and 3000 consumers whose total annual accounts did not amount to 34s. 3d.—the total of the service charge—and who under such a proposal would be met with a large increase in their gas bill.

He realized that he could not hope to get the Town Council to agree to any such proposal, and he therefore decided upon the block system of charge. An analysis of the consumers' accounts in Dunfermline showed that—excluding bulk supplies to two outside areas, and also public lighting—the average consumption was approximately 24,000 c.ft. per annum. This figure was taken as a base, and all consumptions up to and including this amount would be charged at the full rate of 3s. 2d. per 1000 c.ft. per annum. The service charge was equal to 1s. 4d. per 1000 c.ft., so that each consumer who used 24,000 c.ft. paid twenty-four times 1s. 4d.—equal to 32s.—towards his cost of 34s. 3d. The next block on the scale could, therefore, show a large reduction in price, but for the fact that there were so many consumers who used less than 24,000 c.ft., and the loss on these consumers must be made up on the next and succeeding blocks. By the time the second block was passed, however, the greater proportion of the service charges would have been met, and the price could then descend steeply.

The following was the scale decided upon, and it was to be noted that all domestic consumers, whether slot or ordinary, and all industrial consumers could come under the same scale, and no discounts were allowed: For the first 24,000 c.ft. per annum, 3s. 2d. per 1000; for the next 76,000 (making a total of 100,000), 2s. 10d. per 1000; for the next 400,000, 2s. 2d.; for the next 500,000; 2s. 1d.; and for all over 1 million c.ft., 2s. per 1000. This scale and size of blocks would probably not suit any other undertaking, but they had been calculated from a very close analysis of the consumers' accounts. Under the flat rate, 1d. per 1000 c.ft. meant £1500 per annum, and it was most important to observe that this sum, spread over the second block on the scale, would enable Dunfermline to give a reduction on that block of not less than 7d. per 1000 c.ft. In other words, if they could afford to reduce the old flat rate by 1d. per 1000 c.ft. they could, under the new scale, keep the first block at 3s. 2d. and make the second block 2s. 7d. Under such conditions a consumer at present using 24,000 c.ft. per annum and who installed additional appliances knew definitely that the extra consumption would cost him 7d. per 1000 c.ft. less, which was a much greater inducement to business than the offer of a reduction of 1d. per 1000 c.ft. on his whole consumption. Reductions of the order of 1d. per 1000 c.ft. were, he was afraid, of little interest to consumers, and certainly could not induce him to use more gas. In Dunfermline they had advertised this scale for the past month. They had pointed out its advantages to consumers, and had issued some 12,000 leaflets explaining the new system of charge. It might be a coincidence, but the fact remained that during the past month they had sold appliances which would in total yield an annual consumption of not less than 2¼ million c.ft., which to him was good enough to be going on with.

The Scale at Dumbarton.

Mr. James Bell, of Dumbarton, said they had a scheme in operation in his district which had worked very satisfactorily for the past five years, and it had also enabled them to increase their output to some small extent. In Dumbarton they had a scale of charges which were regulated on a sliding-scale basis as regards the quarterly consumption. They found that to go back over the accounts for twelve months to ascertain the credit of each individual consumer was a very big task, so they adopted a scale of rebates on the block principle. They started at 10,000 c.ft. per quarter, and the rebates were fixed as follows: Over 10,000 c.ft. to 20,000, ¼d. per therm; over 20,000 and up to 50,000 c.ft., ½d.; over 50,000 to 100,000, ¾d.; over 100,000 to 250,000, 1d.; 250,000 to 500,000, 1¼d.; 500,000 to 1 million, 1¾d.; 1 million to 2 millions, 2¼d.; 2 millions to 3 millions, 2¾d.; and 3 millions and over, 3¼. In the first year of the scheme the consumption was 152½ millions, and the amount returned to consumers by way of rebate was £711. For the year 1929-30 the consumption was 166 millions and the rebate £750. For the year 1930-31 he anticipated the rebate would be round about £730. The sliding-scale in Dumbarton operated in favour of all gas consumers, no matter whether they were ordinary users or industrial users. Experience, however, had shown that consumers in the municipal housing schemes with shilling prepayment meters were the greatest beneficiaries under the scheme. These were houses with cookers, boilers, and occasionally gas fires. About 10 p.ct. of the consumption was for industrial purposes, and the reason for this somewhat low percentage was that shipbuilding and other industries had fallen off. The scheme was started in 1926, when the output was 136 millions; and the output had now increased to 168 millions.

Mr. David Vass, of Perth, explained that in his city they had a block system for industrial consumers and a flat rate with discount for the ordinary consumers. There was no doubt, as Mr. Campbell had pointed out, that difficulty had arisen between one consumer using a certain quantity of gas for one purpose and another the same quantity for a different purpose. Because of the rates charged being different, there had been friction. In time, he believed, in Perth they might be able to arrive at a suitable block system for every consumer, and it certainly would simplify matters if that could be done. The industrial user in his district—if he was a small consumer—did not get the same advantageous terms as the large industrialist. Unless an industrial consumer could guarantee something in excess of 30,000 c.ft. a year, he had to pay on the ordinary rate.

A System for All.

Mr. John Wilson, of Dundee, believed like Mr. Vass that the system should be extended to everyone who used gas, irrespective of the purpose to which it was applied. In Motherwell and

Wishaw they had a block system for industrial users, and already they had been considering the adoption of some such scheme for ordinary users. At present, however, they were awaiting the arrival of an opportune time when they could reduce the price of gas. It might be worth while for those who were contemplating a reduction in the price of gas to delay action until some new system of charging could be introduced which would not fall as a hardship on the poorer classes of consumer.

The CHAIRMAN took the view that simplicity should be the essence of all charges. Consumers naturally liked to know how the price was arrived at. He rather gathered from what Mr. Fottrell had said in introducing the discussion that, if there was to be a radical change in the method of charging, it would have the tendency of increasing the price to a great number of consumers. He was afraid that the present was rather an unfortunate time for such a change, which would possibly give rise to a great deal of criticism. Those of them who lived in the West of Scotland and the Clyde Valley knew something of the depressed conditions that existed; and of the criticism—if not hostility—which would be aroused by increased rates or charges for the public services. At the same time, that circumstance need not deter those present from preparing for the day when a change in the method of charging for gas could be opportunely introduced.

Mr. FOTTRELL, in replying to the points raised in the discussion, said they were not making the proposals for a change in the present method of charging merely for the reason that they thought the existing principle was not very scientific. There was a real practical reason at the bottom of it all. Underlying the proposed alteration in the method of charging was the intention to compete on equal terms with competitive fuels, and to extend the sphere of usefulness of the Gas Industry. Unless they started out on the basis that the existing consumers should pay a reasonable proportion of the charges that conditions had forced upon the Industry, it was hopeless for them to compete successfully against oil and electrical energy.

It was agreed to defer consideration of the other subject on the agenda, "Development of Large-Scale Gas Supply for Commercial and Industrial Purposes," until a future meeting.

Mr. S. S. OGILVIE followed with a brief but critical reference to the activities of the Central Electricity Board.

CARBONIZED BRIQUETTES

Four Typical Experiments Covering a Wide Range of Possible Materials

By HARALD NIELSEN

Certain statements I made in my article in the "JOURNAL" for May 20—"New Products and New Markets"—perhaps require substantiation, in view of my somewhat sweeping assertion that the Gas Industry could profitably absorb more coal and produce a new fuel which, while possessing the free-burning properties of low-temperature coke, would have a bulk density somewhere half-way between anthracite and ordinary gas coke. I have therefore selected at random four typical experiments covering a wide range of possible materials.

It will perhaps be remembered that I propose to link low-temperature plants to present gas-works undertakings, so that full benfit can be obtained from the potentialities of both. Table No. 1 gives the relevant analytical data. The material from which the briquettes to be carbonized are produced is a low-temperature semi-coke, with the exception of Column I., which relates to briquettes made from a raw anthracite duff, reasonably clean and low in ash, and which is a material which has to-day a market value of approximately 8s. to 10s. per ton only.

Raw anthracite duff is already being briquetted in the large South Wales briquetting plants and used locally or mostly sent abroad to Belgium and France. There is nothing new in the manufacture of these briquettes; it is a well-established industry, which to-day represents possibly the only reasonably satisfactory outlet for anthracite duff, be it smalls from the mine or so-called breaker duff.

What is perhaps the striking feature of this material is the large gas volume given off. It will no doubt come as a surprise to many gas engineers that anthracite, or at any rate semi-anthracite, will yield in the neighbourhood of 10,000 c.ft. of gas per ton, and sometimes even more, but it will be seen from the analysis of the gas (Items 26-36) that the principal constituent is hydrogen. Various anthracites which I have examined for gas-making propensities indicate a hydrogen content of from 65 up to as much as nearly 80 p.ct. by volume, and it will thus be seen that anthracite or anthracite duff will form a very valuable gas-making material for the production of hydrogen, which will be more and more in demand for hydrogenation and oil hardening processes, apart from its use for synthetic ammonia manufacture.

Also of considerable interest is the very low carbon monoxide content, which I have found varies between 5 and a maximum of 8 to 9 p.ct. The gas is very light, and in the form in which it is obtained from the briquettes by high-temperature carbonization will have a calorific value of 430 B.Th.U. gross, which is a very useful gas for all-round domestic purposes.

The briquettes, which were in this particular test made with a low-temperature pitch binder, were extraordinarily hard and dense after carbonizing, and had a bulk density of approximately 52 c.ft. per ton. The content of sulphur in the carbonized briquettes ranges between 0·5 and 0·7 p.ct., and we have here a fuel which will lend itself not only to domestic purposes as an excellent anthracite substitute, but to any industrial process where clean, high-grade material is required. I cannot help feeling that for certain metallurgical processes these briquettes would be superior to the best grade coke. The shatter test (Item 18) is very good.

SEMI-COKE FROM NON-CAKING COAL.

The material described in Column II. was a semi-coke obtained from a non-coking bituminous coal by low-tem-

TABLE I.

	—	I. Raw Semi-Anthracite Duff.	II. Semi-Coke from Non-Coking Bituminous Coal.	III. Semi-Coke from Medium Coking Bituminous Coal.	IV. Semi-Coke from Canadian Lignite.
	Proximate analysis of raw material—				
1.	Moisture	Dry basis	4·9 p.ct.	3·5 p.ct.	Dry basis
2.	Volatile matter	13·3 p.ct.	14·9 ,,	13·8 ,,	15·1 p.ct.
3.	Fixed carbon	79·7 ,,	76·8 ,,	71·1 ,,	71·7 ,,
4.	Ash	7·0 ,,	4·0 ,,	11·6 ,,	13·2 ,,
5.	Calorific value, B.Th.U. per lb.	14,100	13,300	12,400	..
	Ultimate analysis—				
6.	Carbon	85·0 p.ct.	86·0 p.ct.	78·7 p.ct.	..
7.	Hydrogen	3·4 ,,	2·5 ,,	2·8 ,,	..
8.	Oxygen	2·8 ,,	5·0 ,,	3·6 ,,	..
9.	Nitrogen	1·05 ,,	1·3 ,,	1·5 ,,	..
10.	Sulphur	0·7 ,,	1·2 ,,	1·3 ,,	..
11.	Ash	7·0 ,,	4·0 ,,	12·1 ,,	..
12.	Percentage of pitch binder	8·3 p.ct.	8·5 p.ct.	8·0 p.ct.	9·0 p.ct.
13.	Nature of binder	L.T. pitch	H.T. pitch	H.T. pitch	L.T. pitch
14.	Carbonizing temperature	900–950° C.	850° C.	900° C.	650° C.
15.	Yield of coke briquettes	81·0 p.ct.	68·5 p.ct.	75·0 p.ct.	79·0 p.ct.
16.	Sp. gr. of coke briquettes, water = 1	1·3	0·90	0·95	0·81
17.	Bulk density, c.ft. per ton	52	80	75	89
18.	Standard shatter test, remaining on 1-in. mesh	97·0 p.ct.	95·1 p.ct.	96·0 p.ct.	92·0 p.ct.
	Proximate analysis of carb. briquettes—				
19.	Moisture	2·0 ,,	2·5 ,,	2·8 ,,	3·0 ,,
20.	Volatile matter	5·0 ,,	3·5 ,,	4·2 ,,	7·5 ,,
21.	Fixed carbon	84·0 ,,	88·8 ,,	80·5 ,,	75·5 ,,
22.	Ash	9·0 ,,	5·2 ,,	12·5 ,,	14·0 ,,
23.	Calorific value, B.Th.U. per lb. of briquettes	13,000	12,950	12,400	12,150
24.	Tar yield, galls. per ton briquettes	7·7	15·5	11·0	8·0
25.	Gas yield, c.ft. per ton briquettes	10,150	5070	6800	3750
	Analysis of gas—				
26.	$CO_2 + H_2S$	2·6 p.ct.	7·6 p.ct.	4·5 p.ct.	9·6 p.ct.
27.	C_mH_n	3·0 ,,	0·0 ,,	1·0 ,,	0·2 ,,
28.	O_2	0·2 ,,	0·0 ,,	0·2 ,,	1·8 ,,
29.	CO	5·0 ,,	16·8 ,,	15·2 ,,	16·3 ,,
30.	H_2	73·2 ,,	53·7 ,,	58·1 ,,	39·8 ,,
31.	CH_4	12·6 ,,	14·1 ,,	17·0 ,,	23·2 ,,
32.	C_2H_6	0·0 ,,	0·0 ,,	0·0 ,,	0·7 ,,
33.	N_2	3·4 ,,	7·8 ,,	4·0 ,,	8·4 ,,
34.	Calorific value of gas, gross, B.Th.U. per c.ft.	430	365	415	425
35.	Percentage of inerts	6·2 p.ct.	15·4 p.ct.	8·7 p.ct.	19·8 p.ct.
36.	Sp. gr. of gas	0·314	0·467	0·46	0·56
37.	Liquor formed, galls. per ton	7·0	40·0	16·5	18·8
38.	Vol. of L.T. gas, c.ft. per ton raw coal	..	2500	3200	3500
39.	Calorific value, B.Th.U. per c.ft.	..	615	675	332
40.	Vol. of mixed H.T. briquette gas and L.T. gas, c.ft. per ton raw coal	10,150	7570	8200	5960
41.	Calorific value of mixed gas, B.Th.U. per c.ft.	430	450	516	370
42.	Total gas, therms per ton original raw coal	43·6	33·9	42·35	22·1

perature distillation with internal heat application. The original raw coal was of a younger, almost lignitic formation, with a high oxygen content, and produces a very light, rather friable semi-coke, which is to all intents and purposes as free-burning and reactive as wood charcoal. The semi-coke has a bulk density of about 120 c.ft. to the ton, and is even lighter than gas coke. By briquetting this semi-coke with a pitch binder and subjecting the briquettes to high temperature, we obtain a good yield of dense and hard, uniform coke briquettes which possess good carrying properties and have a bulk density greatly superior to average gas coke.

The gas yield from the carbonizing of the briquettes is somewhat low, and the calorific value of the briquette gas would be below the ordinary required standard. But it must be borne in mind that the briquettes are made from a low-temperature residue; and by mixing the briquette gas with the valuable high calorific gas obtained during the low-temperature carbonization or distillation of the raw coal, we should get a satisfactory town gas. The total volume of mixed gas obtained per ton of original raw coal is approximately 7570 c.ft., of a calorific value of 450 B.Th.U. per c.ft. We thus produce from a non-coking coal, which has no value at all for ordinary town gas manufacture, a good volume of suitable gas and a standard, high-grade coke briquette of considerably greater commercial value than the corresponding gas coke.

Briquettes from Medium-Coking Coal.

Column III. relates to briquettes produced from a semi-coke obtained from a medium-coking bituminous coal, possessing coking powers too low to make a satisfactory gas coke. We obtain from this material, which is of considerably older geological formation than the non-coking coal, a bigger gas volume and a mixed briquette and low-temperature gas of about 516 B.Th.U. per c.ft.—in other words, a gas which would meet all possible demands, not only for general domestic use, but also for long-distance transmission. We convert the whole of our solid residue into a saleable article, and thereby completely solve the coke breeze problem.

Column IV. relates to a test on a Canadian lignite somewhat high in ash. Although from a gas-making point of view this material is inferior to a non-coking coal, still a gas yield is obtained of nearly 6000 c.ft. and of a calorific value of 370 B.Th.U. per c.ft., which is quite a useful gas for industrial purposes. The carbonized briquettes are excellent. They have, owing to the lightness of the semi-coke, a somewhat lower bulk density than any of the foregoing materials, but it is still better than that of even a good grade gas coke.

The briquettes from all these materials are easily ignitable and are ideal for open domestic fires, and owing to their superior bulk density they are most useful in closed domestic hot water boilers and furnaces. They will keep alight for longer periods than ordinary coke under the same conditions, and will permit a cooling-down and re-ignition at temperatures where gas coke would long be dead. This property alone makes them highly desirable from the ordinary householder's point of view.

I have studied the question of using various grades of pitch for these briquetting purposes, and I have come to the conclusion that low-temperature pitch, horizontal retort pitch, and vertical retort pitch are all equally suitable, once the specific behaviour of the pitch is understood. There should, therefore, from the point of view of a combined scheme embodying a low-temperature and a high-temperature stage, be no reason why the low-temperature pitch should not be made use of for briquetting, so as to make the plant self-supporting. Furthermore, a considerable amount of the pitch binder is, by the high-temperature carbonization, converted into gaseous therms, which have a much greater commercial value than the corresponding pitch therm.

In Table No. 2, I give comparative data regarding vertical retort pitch and low-temperature retort pitch. Undoubtedly from a gas-making point of view the low-temperature pitch is superior, but the binding properties may be somewhat in favour of the vertical retort pitch, percentage for percentage. The difference is, however, so small that the gas-making propensities of the low-temperature pitch more than outweigh this slight disadvantage.

Table 2.—*Analysis of Pitch Used for Briquetting.*

—	H.T. Vertical Retort Pitch.	L.T. Retort Pitch, Internal Heating.
Volatile matter	65·0 p.ct.	89·2 p.ct.
Fixed carbon	33·0 ,,	8·9 ,,
Ash	2·0 ,,	1·9 ,,
Calorific value, B.Th.U. per lb.	14,750	15,500

My main intention in these articles has been to establish and to give proof of the possibilities of gas-works absorbing more raw coal, and thereby assisting the mining industry, without producing more gas than can be conveniently disposed of, but producing an article which is of greater commercial value than raw coal, and which would be greatly in demand. I have always maintained that the natural distributors of domestic fuel for heating purposes are the gas-works, since they have all the facilities of a distributing organization, and double handling, extensive transport, and small expensive trading organizations, which simply add to the cost to the consumer, would be cut out. Producers and users alike would benefit by the introduction of a new standard product of far greater attraction from all points of view than present-day average gas-works coke, and which could be sold at the same price, giving far greater return for money expended in efficiency and general utility—in fact, the ideal smokeless fuel.

New Gas Showrooms at Cottingham, Yorks.

A Converted Kinema Hall Provides Up-to-Date Gas Showrooms for Hull Suburb

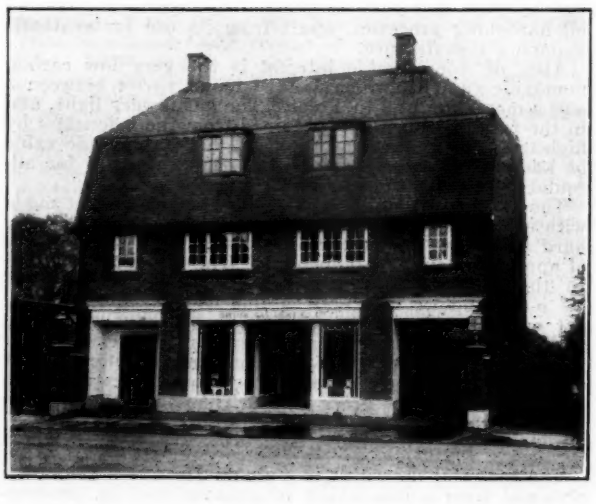
New showrooms of the British Gas Light Company, in King Street, Cottingham, were opened to the public on Monday afternoon, May 18, by Councillor A. E. Stephenson, Chairman to the Cottingham Urban District Council.

Apologizing for the absence of Mr. H. E. Copp, Engineer of the Hull Station of the Company, the Chairman read a message from him, which stated that the Company had for many years felt that the gas supply to Cottingham was inadequate in accordance with modern requirements. The new gas main was almost completed, and would be available for use before the winter.

As had been said by the Prince of Wales, if a thing was worth selling it was worth bringing to the notice of the public. These words applied to the use of gas. Some appeared to think gas as an illumination means had had its best day. Such was far from the truth, however, for in England and many other cities where electricity was cheap, the use of gas continued to increase. They were confident that this would continue so long as service was given to the consumer.

Councillor Stephenson, performing the opening ceremony, said the building was originally a kinema hall, and now through the efforts of the Company, instead of having to go to Hull for their gas requirements, their shopping could be done in Cottingham.

Councillor A. Dixon, supporting, spoke of the good rela-



tions which existed between the Gas Company and the Urban Council.

Miss Tuxford dealt with gas as a domestic fuel, and stated they were about the third cheapest in England for gas. Modern gas apparatus was particularly easily managed, and by means of automatic control housework could be done while meals were cooking.

Mr. F. C. Robinson proposed thanks to the various speakers. He paid tribute to the contractors and their chief draughtsman and showroom manager for their work.

Mr. R. A. Weston supported, and called attention to the modern switches for gas illuminations and to the cookers. He hoped Cottingham people would make those showrooms their headquarters for matters concerning gas.

Mr. Perkins said that that day marked the realization of a hope he had had for 25 years. They were there to give service, which was to-day, and always had been, the endeavour of the Company.

The building is designed by Mr. P. Morley Horder, F.R.I.B.A., of London, while the contractors were John Houlton and Son, Ltd., of Hull.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany

A TOWER SYSTEM FOR DRY PURIFICATION.

F. Lenze and A. Borchardt, in "Das Gas- und Wasserfach," 1931, 74, 445-449 (May 16), describe the patented system of dry purification in towers installed in the gas-works at Hamborn and at Alsdorf.

The system has as its advantages small ground space, easy straightening out in case of ground subsidences, easy supervision, change of purifiers in one shift with little labour, use of one gang of men only, small capital cost in spite of the high degree of mechanization, small operating and labour costs, and hence even distribution over the year of the labour involved in changing the purifying medium.

The original installation was for a capacity of 21 million c.ft. per day. This is now being doubled in capacity while a similar extension will be undertaken before long, whereby the capacity will be increased to 63 million c.ft. per day.

The towers are cylindrical in shape, the gas entering from below and leaving from the side, about two-thirds of the way down. The oxide is contained in 14 superimposed baskets which are inserted and withdrawn by means of a crane. The baskets, which are polygonal in shape, have twelve sides and are divided into twelve sections by means of vertical plates radiating to the corners from a central gas pipe. These plates carry supports for the wedge-shaped grids on which the oxide is placed, there being two decks of grids in each basket. The central pipe is provided with slots serving as gas passages. The gas passes into the baskets in parallel and penetrates the oxide in a vertical direction, passing upwards through the upper layer of oxide and downwards through the lower layer. It leaves the baskets via gaps which are formed by the feet, whereby one basket rests on its neighbour and thus passes into the space between the walls of the basket and the interior of the tower. The central pipes are formed into a complete pipe by use of a flexible packing inserted in a channel in the top flange of each section. Junction is effected by the agency of gravity when the successive baskets are lowered into the tower and finally a tight seal is secured by means of a screw device in the topmost basket.

The foundation of a tower is so arranged that the tower is joined to a 24 in. high ring of reinforced concrete which rests loosely on a pedestal. Thereby it is possible to adjust any canting over of the tower caused by earth subsidence.

For an installation of capacity 21 million c.ft. per day, there are two rows each containing 4 towers 52 ft. 6 in. in height and 19 ft. 4 in. in internal diameter. Connections are so arranged that in each row the sequence can be altered. Double plate valves, with a safety device to avoid distortion, are employed and are filled with water above the plates when a purifier is being changed, so that absolute tightness may be secured. There is a control platform between the rows of towers. This is shut off along the length of the rows by the towers themselves and by narrow walls of asbestos cement between the towers. The end walls are of plastered steelwork and are joined on to the end towers. A further platform at the top forms the roof, and windows in the end walls serve to provide light and ventilation. Below the control platform is a basement containing the mains leading to the towers, the condensate pipes, and the heating equipment. The travelling crane required in connection with the plant has a 75-ft. span and a capacity of 30 tons.

The ground space occupied by a purifier of 63 million c.ft. daily capacity is 2375 square yards, not including the oxide sheds, whereas for an ordinary box purifier, a ground space of at least 9670 square yards is required, or approximately four times as much.

The towers are re-charged by withdrawing the baskets and substituting freshly charged spare ones. The crane operator by himself attends to this and deposits the baskets outside the oxide shed where he picks up the fresh ones. The normal gang of four purifier men suffices, in one 8-hour shift, to bring the new baskets from and to transfer the spent baskets into the oxide shed. In the period between two changes, this gang attends to the emptying of the spent oxide and the re-charging of the baskets with fresh oxide. Since the handling of the oxide and the filling of the baskets are mechanical operations, and the same men are always in charge, there is the advantage that packing of the oxide is always uniform. Revivification *in situ* is accomplished automatically by admission of a small proportion of air proportionate to the rate of flow of the gas.

Comparative costs for tower and box purifiers are as follows for a daily output of 63 million c.ft. of gas, an H_2S content of 220—260 grains/100 c.ft. and 24 changes per year.

	Tower System. £		Box System. £
Cost of complete installation, including handling equipment	78,000	..	114,000
Annual charges—			
Capital charges, amortization, and maintenance (15 p.ct.)	11,700	..	17,100
Labour	500	..	1,875
	£12,200	..	£18,975

A tower purifier is erected very quickly, only 3½ months being required for the installation of a unit having a capacity of 21 million c.ft. per day.

No information is given as to the sulphuretted hydrogen content of the purified gas.

A NEW METHOD FOR MEASURING GAS VELOCITIES.

In "Journal des Usines à Gaz," 1931, 55, 192-194 (May 5), is reproduced from "Zeitschrift des Oesterreichen Vereines von Gas- und Wasserfachmännern" of Sept. 1, 1930, a description by F. Bössner of a method of measuring gas velocities worked out in collaboration with Matuschka, König, and Ochler. The method involves admitting instantaneously a small quantity of chlorine into the gas stream at a fixed point and noting the time in seconds (t) before chlorine is detectable in the gas flowing from a sampling tube at a position further along the main. If V represents the cubical capacity of the main between the two points, the rate of gas flow is $\frac{V}{t}$ c.ft. per second. The distance between the two points should be such that the time required for the gas to traverse the distance is 50-200 seconds. Starch iodide paper or solution is used to detect the chlorine, and men with synchronized chronometers and flags give signals to each other and record the time of admission of the chlorine and the time at which chlorine is detected. The chlorine is admitted to the gas from two 5 lb. cylinders of liquid chlorine arranged to deliver the gas into two tubes inserted into ½ in. holes diametrically opposite each other in the main. The method, which is applicable to coal gas, producer gas, water gas, &c., whether crude or purified, gives results generally agreeing within 2 p.ct. with the velocity as measured by a meter, though in examples which are given the differences were respectively 7·8 p.ct., 4·5 p.ct., and 4·5 p.ct. from the velocities deduced from the flow as recorded by the meter. These figures relate to tests which were carried out with a view to investigating the effect of altering the length of immersion of the

chlorine admission pipes in a main of 28 in. bore, the immersions being respectively 18, 12, and 6 in. and the distance between the two fixed points 1800 ft.

AUGMENTATION OF THE OUTPUT OF WASTE-HEAT BOILERS.

Y. Queret in the "Journal des Usines à Gaz," 1931, 55, 186-192 (May 5), gives an account of augmentation as applied to the waste-heat boilers attached to the Woodall-Duckham vertical retorts at Clichy. Augmentation consists in securing an additional supply of heat for the waste-heat boilers, whereby the quantity of steam generated is increased. This is secured by taking advantage of the fact that the waste gases from a setting always contain oxygen and are therefore able to bring about the combustion of a certain amount of additional producer gas admitted to the waste-gas flues ahead of the boiler. The temperature and heat content of the waste gas are thus increased. The following table gives information as to the volume of producer gas (28 p.ct. CO, 9 p.ct. H_2, 5 p.ct. CO_2, 58 p.ct. N_2; C.V., 118 B.Th.U. per c.ft.) which can be added to waste gases of different oxygen contents, and shows the temperature rise obtained when the temperature of the original waste gas is 450° C. and a fixed addition of producer gas is made. The temperature of the producer gas is assumed to be 30° C.

Volume of producer gas used for underfiring	100 c.ft.	100 c.ft.	100 c.ft.
Oxygen content of the wet waste gas	1 p.ct.	3 p.ct.	5 p.ct.
Temperature of the waste gas	450° C.	450° C.	450° C.
Volume of producer gas which can be added	10 c.ft.	33 c.ft.	62·5 c.ft.
Volume which can be added per 1 p.ct. of oxygen	10 ,,	11 ,,	12·5 ,,
Temperature of the producer gas added	30° C.	30° C.	30° C.
Temperature rise effected by addition and combustion of 10 c.ft. of producer gas	125° C.	118° C.	105° C.

The principles involved are explained, and curves are given by means of which it is possible to deduce the temperature rise caused by burning different amounts of producer gas in waste gas of various oxygen contents and of different temperatures. The curves are based on a producer gas having the composition indicated above and having a temperature of 30° C.

In carrying out augmentation, producer gas at a pressure of 6-7 in. W.G., is admitted to the waste gas flue by way of a pipe having a suitable hole and movable cover plate to permit of lighting the gas and inspecting the waste gas flue. The pipes are provided with valves whereby the quantity of producer gas admitted may be regulated. At Clichy, where a central battery of producers is installed, admission of producer gas to the waste gas flues was very easy, since the gas is under pressure. However, in works having internal producers, advantage may be taken of the suction in the waste gas flues to draw in the producer gas.

The following table shows the results obtained from the waste-heat boilers with and without augmentation during two 24-hour tests.

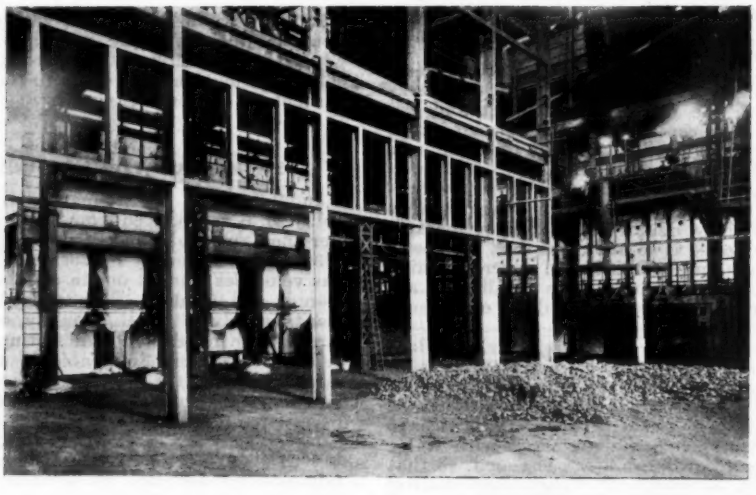
—	Without Augmentation.	With Augmentation.
Coke charged to the producers, tons	30·6	32·1
Volume of producer gas made, million c.ft.	5·2	5·3
Volume of gas to superheater, million c.ft.	12·9	12·7
Temperatures—		
Inlet to superheater, ° C.	471	536
Inlet to boiler, ° C.	432	468
Outlet from boiler, ° C.	221	240
Steam obtained—		
Pressure, lbs. per sq. in.	115	134
Temperature, ° C.	284	318
Weight, lbs.	72,000	98,000

The output of steam was considerably increased, due to the fact that the gas is admitted at a higher temperature. It is to be noted that the useful effect is exerted not on the superheater but solely on the boiler.

LEIGH

The Second Installation of Glover-West Vertical Retorts in a Well-Known Lancashire Cotton Town

From "West's Gas"



Some of the best Lancashire gas coals are mined in and around Leigh, but just as one notices that the best wine is always exported from the districts where the vines grow and none is left for local consumption, so at the Leigh Gas-Works only the leavings and the slacks are carbonized.

The first Gas Company was formed in 1834 with a capital of £2000. The concern was purchased by the local board in 1874 when the make of gas was 23 millions. Last year 275,769,000 c.ft. of gas was made, and the capital in the undertaking had grown to £273,000.

50 P.Ct. Sales Increase.

It is significant that the sale of gas has increased by over 50 p.ct. in the last ten years despite the very severe industrial depression and the drastic curtailment (amounting to complete cessation in most cases) of factory lighting.

The Department has prided itself on being progressive in the adoption of improved types of plant and has run through the whole gamut of carbonizing practice. The original plant consisted, of course, of horizontal retorts, but in 1897, inclined retorts were erected by the late Mr. John Foster, who subsequently became Chief Engineer to the Birmingham Gas Department, and these were in service to some extent until quite recently. It is noteworthy that Mr. Foster applied waste-heat recovery as long ago as 1900 to the extent of passing the products of combustion through a Lancashire boiler. In 1915 an installation of 51 Dessau intermittent vertical retorts was built under Mr. J. Gibson.

These were later reconstructed by the present Engineer in 95 p.ct. silica retorts; they are still in service.

In 1921 Mr. Bowen installed a set of four Glover-West vertical retorts of the 33-in. "New Model," the first of the type to be built. Mr. Bowen had had considerable experience of steaming in the intermittent retorts and was desirous of securing what he called "clean" gas (that is, of low CO_2 content) of a quality about 430 B.Th.U. His expectations and those of the makers have been so completely realized that since these retorts were built, with very few exceptions indeed, all the Glover-West retorts erected have been of the "New Model."

Seven Years' Working.

This setting came into operation in January, 1922. It was built in Derbyshire siliceous material and it worked almost without cessation until November, 1930, the actual number of gas-making days being 2708, or 7·42 years. During this time approximately 27,000 tons of local slacks passed through the retorts and nothing of any better quality. The retorts are very little the worse for this strenuous duty. They have never been re-set, though joints have been plugged on two or three occasions, and general pointing has been carried out as required.

In the light of this experience a further contract was awarded to West's Gas Improvement Company in 1929 for three settings containing 12 of the 40-in. "New Model" retorts. The work was commenced in January, 1930, and the plant was brought into operation in the middle of November.

The plant was guaranteed to give a production of 900,000 c.ft. of gas per diem when carbonizing Lancashire gas nuts yielding 85 therms per ton at 450 B.Th.U. per c.ft., but Mr. Bowen is adhering to his policy of using the same local slacks as hitherto. Over the past few weeks, during which the new plant has been working alone, a yield of 82·59 therms per ton has been realized from these slacks, the calorific value as issued to the town being not less than 430 B.Th.U.! The analysis of the gas during the same time shows an average of 2·6 p.ct. of CO_2—a figure which speaks volumes for the efficiency of the steaming process in the retorts.

Other Developments.

Leigh Gas-Works has seen considerable change apart from that in the carbonizing plant under the engineership of Mr. Bowen. A three-lift spiral gasholder erected two years ago is a conspicuous object in the centre of the town. Additional water gas plant has been installed, and consequential developments have taken place in all parts of the works.

The price of gas is now 2s. 7d. net per 1000 c.ft., and as free maintenance service is included (materials, of course, are charged) it may be truthfully said that the consumers "have a good thing." Evidently they think so, since the sales went up by no less than 14½ millions last year. For large consumers prices range down to 1s. 10d. per 1000 c.ft. These prices are to be compared with the pre-war standard rate of 3s. per 1000 c.ft.

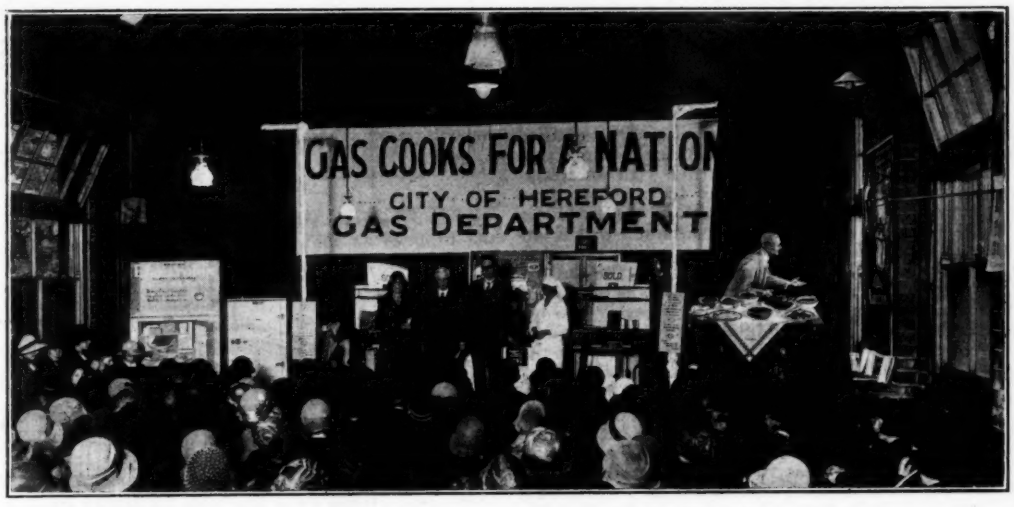
The present satisfactory condition of the undertaking is the result of the provision of efficient plant and the judicious employment of new capital. The Chairman of the Committee, Ald. W. Grundy, J.P., and the Engineer and Manager, Mr. F. Bowen, M.Sc., have steadily aimed at the reduction of overhead charges; the measure of their success is that whereas in 1916, when Mr. Bowen took charge, the Interest and Sinking Fund charges were 1s. 5d. per 1000 c.ft., they are now no more than 5d.

A vigorous sales policy is in operation, and we are sure that the Leigh Gas Undertaking will take a very high place in the country for the successful and efficient manner in which it has taken advantage of the opportunities of applying gas to all those purposes, domestic and industrial, to which it is suited in the area within which it operates.

T. A. T.

Cookery Demonstrations at Hereford

The Hereford Corporation Gas Department have just concluded a most successful series of cookery demonstrations which they, in conjunction with Messrs. Radiation Ltd., held in St. Peter's Church House, Hereford



AN INTERESTED AUDIENCE AT THE HEREFORD COOKERY DEMONSTRATIONS.

The demonstrations were opened on Monday, May 11, by the Mayor of Hereford (Councillor F. Lewis Smith), when 107 people were present. During the twenty demonstrations, no fewer than 1908 people attended, thus clearly showing the popularity of gas as a fuel for cooking. The Gas Department in addition had an attractive exhibition of modern gas apparatus, which was much admired and promoted a good deal of interest among consumers. In order further to stimulate the interest in the demonstrations, a cake-making competition was organized, and 56 entries were sent in for the three prizes offered.

Councillor Oatfield (Acting Chairman of the Gas Committee) in the regretted absence of Alderman C. Witts, J.P., through indisposition, presented the prizes to the successful ladies at the conclusion of the last lecture on Friday, May 22, when there was an attendance of well over 200. Mr. Oatfield was supported by Mr. Arthur Roberts, the Engineer and General Manager of the Department.

The Hereford Gas Department have always fostered a progressive policy, since any gas apparatus can be obtained on very favourable hire purchase terms, and only two years ago the Committee resolved to offer the "New World" cooker on simple hire. The result of this step has been the replacing of well over 1000 obsolete cookers, and has undoubtedly enabled the Department to retain the cooking load in face of keen competition. The Department also have under consideration a scheme for hot water installations on a "daily all-in charge."

THE "JOURNAL" TECHNICAL RECORD

Which contains Full Reports of Meetings of Gas and Allied Associations

Institute of Fuel

JOINT MEETING WITH THE INSTITUTION OF GAS ENGINEERS

A Joint Meeting of the Institute of Fuel and the Institution of Gas Engineers was held in the Rooms of the Chemical Society, Burlington House, Piccadilly, W. 1, on Wednesday, May 13, when a paper by Dr. Ing. Adolph Thau (Berlin) on "The Continuous Production of Water Gas from Powdered Fuel" was read and discussed. Mr. E. C. Evans (Joint Hon. Secretary of the Institute of Fuel) presided.

THE CONTINUOUS PRODUCTION OF WATER GAS FROM POWDERED FUEL.

By Dr. A. THAU, Berlin-Grunewald.

In opening this paper the author explains that the generally adopted present-day method of producing water gas is in technical respects combined with the disadvantage of an intermittent operation of alternatively blowing and steaming; and though semi and fully automatic devices have been successfully introduced with a view to making these changes more or less independent of the operator, the water gas has still to be produced intermittently, and solely during the steaming periods.

From an economical point of view production costs depend upon the consumption of a high-class lumpy fuel such as coke or coal free from smalls. Many efforts have been made during recent years, particularly since hydrogen has been found to serve so many different purposes in the chemical industry, to reduce the price of water gas by utilizing a cheaper fuel. Nevertheless, in water gas processes, successful working with small-grain fuel is unknown up to the present time.

The author then proceeds to consider the problems presented in the use of small-grain fuels, and powdered fuels, and describes in detail a number of plants which have been produced, including the layout of a trial plant installed at the Berlin Gas-Works. Operating results in connection with the latter are given in detail. together with an analysis of the heat balance, and in referring to these trials he states that they disclosed that the body of the producer was not sufficiently insulated on the outside, which accounted for the rather heavy loss of heat which occurred, but which defect could easily be remedied in the future. For the purpose of these trials the plant was equipped with all the usual measuring instruments necessary to obtain accurate data, and a small laboratory was prepared for use in connection with them, in order that the information obtained should be as reliable as possible.

THE COMMERCIAL PLANT.

The deficiencies in the construction of the trial plant pointed out above, appearing principally in connection with too high a consumption of heat, have been avoided in the design of the commercial producer shown in longitudinal section in fig. 1, and in vertical section in fig. 2. The upper part of the producer in fig. 2 is shown on the left from the centre line as a section through a reaction cell, and on the right through a combustion chamber, and fig. 2 also shows the auxiliary plant for treating the raw coal taken in, delivering it in the form of dry powder into the feeding arrangement of each reaction cell.

The producer is designed for an output of about 15,000 cub.m. (520,000 c.ft.) of water gas per 24 hours, and it consists of seven reaction cells (2) and eight combustion chambers.

The radiating surfaces are in this design very much reduced compared with the trial plant, particularly by arranging two separate recuperator units underneath each combustion cell. The air or gas for combustion is introduced on the base of each recuperator unit through the openings A shown in fig. 2. Air or gas travels through two parallel rows of three horizontal tubes B each. These

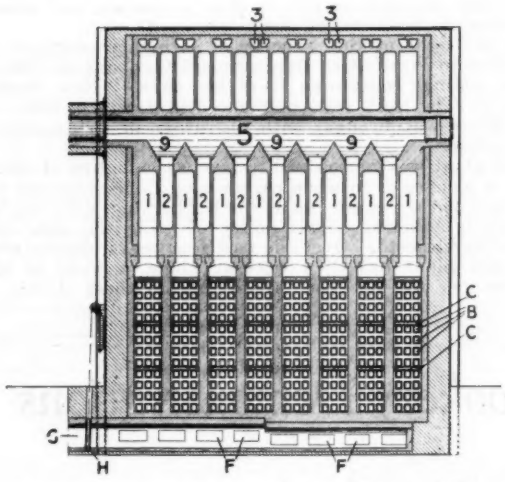


Fig. 1.—Longitudinal Section through Commercial Producer with Seven Reaction Cells.

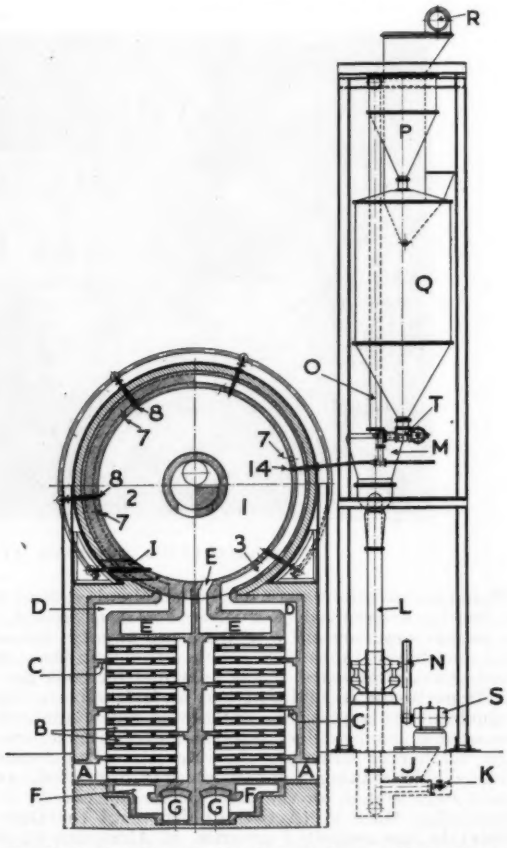


Fig. 2.—Vertical Cross Section through Commercial Producer, including Drying, Grinding, and Feeding Plant.

tubes are of square area and are made of a special ceramic material reducing a diffusion of the gases from inside to the outside, or vice versa, to a minimum. Air or gas travels in a zig-zag way upwards, their way being prescribed by the horizontal baffle walls C. By means of the connecting flue D between recuperator and producer the air and the gas enter each a separate circular distributing flue (3) of the producer which, in this construction, is fed from both ends, the air or the gas meeting on top in centre of the producer. The combustion products leave the combustion cells on the base through the flues E and travel downwards through the recuperator around the horizontal air tubes B, transferring their sensible heat to them. The gases leave the recuperator on the base by the connections F leading to two common chimney flues G provided with brick damper slide H. As fig. 2 shows, the recuperator is divided into halves by a central partition wall so that in one half the air is preheated and the producer gas in the other.

By this arrangement of the recuperators immediately underneath the producer, the reaction cells are no longer accessible from below, as on the trial plant. Though, as the trials have proved, this is not a necessity, means have also in this case been provided to render the reaction cells accessible on the base from two opposite sides by fitting in the brick-block I, which may be withdrawn for the purpose, providing the shell of the producer with corresponding lids in these places. In every other respect the design remained the same.

The part of the plant in connection with the feeding of the fuel may be arranged, depending upon local circumstances, on three different principles.

(1) It may be possible to obtain powdered fuel readily ground in special railway cars and transfer it pneumatically into the overhead bunker of the producer. In this case the auxiliary plant will consist simply of the bunker and a fan to produce the necessary vacuum to convey the fuel from the wagon direct into the bunker. Whether it is advisable to adopt this arrangement is mainly a question of freights, since the special cars cannot take a load in their home journey, and this additional freight must be accounted for.

(2) If the fuel to be gasified does not contain much moisture so that it can be ground without a preliminary drying being necessary, only a mill would be required to grind the fuel, and an arrangement to convey it pneumatically into the overhead bunker. This outfit will suffice for plants on which unwashed run-of-mine smalls are to be gasified, and also coke ballast from the screens dealing with dry cooled coke.

(3) In all cases where raw fuels with higher contents of water are to be used, which cannot be ground to powder without a preliminary drying, a drying plant must be added from which the fuel runs into the mill and is then conveyed pneumatically into the overhead bunker. Since the usual drum dryers consist of rather large and expensive units which for economic reasons are not adaptable for treating comparatively small amounts of fuel, the Rema-Rosin gas circulating dryer will be adopted for the purpose, as indicated in fig. 2.

Quality of the Fuel.

The physical quality of the fuel to be gasified has been sufficiently defined in that powdered fuel as used in the ordinary furnaces designed for the consumption of powdered fuel may be used in this producer. Under these circumstances any solid fuel which can be reduced to the required fineness by mechanical means may be consumed for the production of water gas by this process.

In chemical respects it is important that the fuel should not have any, or at any rate only a very low, agglutinating power, so as to avoid the formation of coke which may be deposited on the side walls of the reaction cells just near the entrance of the coal, and cause in time an obstruction difficult to remove. Coal with a high coking index should thus not be used for this purpose, and for this reason all fuels of young geological age will lend themselves excellently for this purpose, all the more since such fuels are also highly reactive.

A further important property to be taken into account is the melting point of the ash in the fuel. It will be readily understood that if the ash melts at a temperature reached by the side walls of the reaction chambers, the ash of those particles touching the walls will be fused and cover the walls with a glaze, reducing the transmission of heat, or in bad cases the liquid slag will run down and collect in the base of the chambers.

From these observations can be deduced the fact that the melting point of the ash must be ascertained, and if its temperature is below that of the walls of the reaction cells, the latter must be reduced correspondingly if no other fuel is available for the gasification. Generally the melting point of the ash of true coal is well above the 1200° C. (2190° Fahr.) at which the reaction chambers are operated, and only fuels containing certain proportions of salts tend to fuse at an appreciably lower temperature, and are best not used for the purpose, since to operate the process with very much reduced temperatures may impair its efficiency and economy quite considerably.

The importance of the reactive properties of the fuel to be gasified has already been mentioned, and powdered coke or coke ballast containing a high proportion of abrased carbon in the form of graphite may not react easily with the steam. Semi-coke produced by low-temperature carbonization, particularly by internal heating, will lend itself much better for consumption in this producer owing to the absence of carbon deposits which are mainly responsible for impairing the reactivity.

Rema-Rosin Dryer.

The fuel is, as shown in fig. 2, delivered into the hopper J placed conveniently into a pit, and underneath the hopper a breaker K, serving at the same time as a feeder, is provided, delivering the fuel into the vertical pipe L. This is open on the base and connected to the waste-heat flue G of the recuperator. The fuel is drawn up pneumatically, together with the hot air, and dried at the same time. On top the fuel passes the separator M in which all pieces not sufficiently dried are retained and returned by means of a downcomer and enter the mill N in which they are ground and discharged again into the pipe L by means of a slot forming a communication between the standpipe and the mill. The fuel, sufficiently fine and dry, is drawn up through the pipe O into the cyclone discharger P on top of the storage bunker Q. The discharge between cyclone P and hopper Q is effected by an air-tight valve.

To the top of the cyclone P is connected a pipe R leading to a fan creating the necessary vacuum to draw fuel and drying gas through the dryer and convey the fuel to the cyclone P. The fan blows the air through a dry and a wet dust catcher into the atmosphere.

Fan and dust catchers are not included in fig. 2, but it will be noted that apart from the motor driving this fan and the mill motor S, no further power is required for the drying plant. The feeding arrangement T is shown similarly to that applied on the trial plant, but a different arrangement selected from the many approved designs now on the market will be adopted, the exact type being not decided upon as yet.

The pipe L of the dryer is so arranged that by a valve connected near its base, air can be admitted so as to adjust the temperature of the circulating gases to the desired temperature. This is important as the waste gases by themselves are generally too hot to use them without diluting them with a corresponding volume of air. As the descriptions and fig. 2 show, this type of dryer is a very simple but efficient and not very expensive arrangement. Its capacity in relation to the amount of water to be evaporated and the gas temperature applied depends upon the length of the pipe L. With very wet fuels it may be necessary to use two or three drying pipes in succession and connect them together on top and bottom by means of double bends so as to increase the length of the way and the time for the fuel to pass through the dryer in which it is exposed to the hot gases.

As already said, the Rema-Rosin dryer is particularly adaptable for this plant, owing to the comparatively small throughput of such producers which for the present unit with seven reaction cells would equal approximately 7-8 tons of coal per 24 hours. Naturally, it is intended to run the drying and grinding plant only for the required time during one shift per day, and to provide the storage bunker so large that its contents will suffice to feed the producer for over 24 hours. The storage bunker runs out on its lower end to one single tapered mouthpiece with a feeding arrangement distributing the fuel to all the reaction cells in the producer.

Application of the Process.

Apart from the addition of water gas to domestic gas which has become so customary that nearly every gasworks operates nowadays a water gas plant, the interest taken in the production of a cheap water gas has largely increased in recent years on account of the ever-growing demand of hydrogen by the chemical industry for various processes, and particularly for the synthesis of ammonia, and still more recently for the hydrogenation of oils. The cheapest source for the production of hydrogen is water gas, which consists of up to over 50 p.ct. of that product. For all these purposes the round cell producer will be adaptable, and being independent from expensive high quality lumpy coke, any cheap fuel sufficiently reactive may be utilized for the manufacture of water gas. Since the producer does not contain a fuel bed the operation can be adjusted easily and the effects of such alterations be noted by the quality of the water gas almost immediately. The composition of the water gas can be varied within wide

limits, depending upon the purpose for which the water gas is to be used.

In gas-works practice the calorific value of the water gas may be increased so that it may come up to the standards of domestic gas by feeding one or several reaction cells of the producer with tar or oil. Under these conditions a mixed gas of high calorific value will be produced, depending upon the proportion of liquid fuel being gasified in relation to the throughput of solid fuel. Without intending to suggest that the producer will replace a whole gas-works, there is no doubt that the possibilities of its application and its adaptability for the various kinds of fuel available, or to the quality of gas to be desired, goes far beyond the normal water gas process as generally applied so far.

Further Trials.

The request to prepare this paper came earlier than was expected, and though the technical success of the process has been fully assured so far, a number of conclusive results are still needed, and can only be obtained by a series of further trials, for which purpose the plant is being altered again. It should be mentioned here that the producer itself has not required any constructional alterations whatever, and while the first rebuilding of the plant was connected with the feeding arrangements for the fuel, the present reconstruction is applied to the gas cleaning plant only. The principal alteration is the addition of a dust catcher of the cyclone type, while the two coke scrubbers have already before been disconnected and the gas conducted through a Feld centrifugal washer.

The operation of this dust catcher will be extensively tried. A mixture of fresh fuel and ash will be passed through several reaction cells and at intervals a certain amount of residue will be withdrawn through the bottom outlet valve of the dust catcher.

Trials will also be made as to the gasification of tar and cheap liquid fuels to which reference has already been made, and no technical difficulties are expected in this connection. The coal feeding pipe of the reaction cells will simply be replaced by a dispersing nozzle fed from a high level tank heated by a steam coil.

Another series of trials will be carried out by introducing hot air in a measured proportion into the cyclone dust catcher in which the temperature is still high enough for the oxygen of the air to cause a partial combustion. The purpose of this trial is to obtain a water gas containing hydrogen and nitrogen in the exact proportion for the synthesis of ammonia.

Any gas engineer will raise the question at once whether it is possible to consume coke dust, the so-called coke ballast in this producer, for the manufacture of water gas. This is also a problem which is included in the further programme of trials. It must be kept in mind that though the coke ballast may be had for nothing on most works, it must be dried and ground, and whether the powdered coke ballast is sufficiently reactive for the formation of water gas within the time the particles travel through the cells is a problem worth investigating. Opinions as to the technical and economical results differ so widely in this connection that the problem will not be further discussed until trial results can take the place of speculative assumptions.

If such a producer plant is to be erected at a gas-works operating central gas producers, it will be easy to conduct a portion of this gas to the water gas producer for the heating of the cells, and the same applies to the necessary steam which may be taken from an existing boiler plant.

Where such a water gas plant is adopted independent from any existing plant, it would be necessary to add a small gas producer unit to generate the gas necessary for the heating of the producer cells, and if no steam is available also to raise the steam for reaction in a small vertical boiler heated by producer gas or waste heat. It may be convenient in such cases to do without the auxiliary gas producer and heat the combustion chambers with a portion of the water gas produced. Trials in this direction are to be made. The results of the trial will show how much water gas may be available for delivery per cell in operation under these conditions over and above the consumption of the producer. If the producer is heated with its own water gas, a small auxiliary producer will still be necessary for heating and starting up at the commencement if no domestic gas is available for the purpose.

To be quite independent from producer gas, the suggestion has been made repeatedly to feed the heating cells with powdered fuel or to connect them to a common furnace heated with powdered fuel. Trials to this effect naturally require an entire reconstruction of the producer, and this is also taken into consideration for a later date.

Preliminary trials have been made to use the producer as a so-called methane converter to introduce coke oven gas instead of fuel for the methane to be decomposed, and to react with the steam. The contents of methane were reduced from 16·6 p.ct. to 4·6 p.ct., while the contents of hydrogen were increased from 51·3 p.ct. to 65 p.ct., the gas volume being increased under this treatment by 50 p.ct. These trials have been made temporarily with domestic gas in a qualitative way, without being able to determine the possible throughput, and will be taken up again to ascertain the capacity per cell. This process is important in cases where surplus coke oven gas is to be used for the synthesis of ammonia. At present huge apparatus on the principle of regenerators in heavy iron shells operated alternatively under pressure are used for this purpose.

Economic Results.

It has already been mentioned before that this report has been compiled prematurely, and before the trials have come to a conclusive end. This reflects also upon the economic situation which cannot be laid down yet reliably as the available figures and costs do not allow to prepare a reliable cost sheet. It is only approximately known as yet what the producer will cost, including its auxiliary plant, and preliminary calculations made merely refer to particular local conditions in connection with lignite deposits. It can at present be said with certainty that the water gas produced by this process is considerably cheaper compared with the costs for water gas made from a high-class fuel in the normal intermittently operated water gas plant. If it was not so it would be useless to bother with the process. Reliable cost sheets will be forwarded as soon as the further series of trials commencing shortly is brought to conclusion, and the author expresses his regret for being compelled to leave the paper incomplete in this direction at present.

Conclusion.

The manufacture of water gas from a low-grade fuel provides a problem, for the solution of which many suggestions have been made without coming to practical results. Dr. Oswald Heller has developed a water gas producer of horizontal cylindrical shape divided into a number of heating and reaction cells in alternative succession, like a coke oven battery. While the heating cells are arranged for the combustion of producer gas, powdered fuel from one place on the periphery and superheated steam from seven places of the periphery is blown tangentially into the reaction cells, so that during the passage through these water gas is being formed. The trial plant erected and operated at the Tegel gas-works of the Berlin Gas Undertaking is described by drawings and photos, and the cleaning of the water gas by means of a centrifugal washer is explained. The heat economy of the process is laid down, supplemented by a Sankey diagram, and the problems to be investigated by a contemplated series of further trials are mentioned. The results of the latter will also provide for the preparation of reliable cost sheets, since at the present juncture the figures available do not suffice for proper consideration of the costs of the water gas produced by this process, so that no figures could be stated in the paper. Finally, a commercial unit of such a producer with the auxiliary plant for the preparation of the fuel is described so as to show the difference compared with the trial producer, the effect of which is very much impaired by its unnecessarily large radiating surfaces exposed to the atmosphere. These had to be taken into account from the start as a matter of precaution to render all parts of the plant readily accessible, and can be avoided on commercial units.

Discussion.

The Chairman, in expressing thanks to Dr. Thau, said it was of advantage to know something about an apparatus when it was "in the rough," when it was still in the semi-commercial stage. Having had the opportunity of seeing the plant at Berlin last year, the Chairman appreciated some of the difficulties which had to be overcome in order to obtain the results described. He had also been impressed by the control system which Dr. Thau had adopted. He had been intrigued by the information given concerning the producer plant at Leuna, having a throughput of 750 tons of coal per day. When one remembered that the biggest producers employed in the steel industry in this country had a throughput of the order of 50 tons per day, it was evident that the methods employed at Leuna were entirely different from the ordinary methods of gasification. He expressed the hope that Dr. Thau would use his influence with the I.G. Farbenindustrie A.G. to obtain for the Institute of Fuel some details of that producer, which was of very great interest and importance to engineers in this country. The Chairman was also impressed by the author's reference to the use of centrifugal force to obtain maximum time of contact between the solid particles of fuel and the gas. The question of efficient gas-solid-contact was becoming more and more important, not only in pulverized fuel practice but also in blast furnace and open hearth practice; and he wondered whether the subject had been considered in the past from the point of view of fundamentals. He recalled a paper read before the Institute recently by Mr. T. F. Hurley (of H.M. Fuel Research Station) dealing with an extremely simple but very efficient powdered fuel burner adopted at that Station. It would be interesting to know whether that burner could be adopted for use in the production of a high-grade pro-

ducer gas, and secondly, with some modifications, for the production of water gas, using powdered fuel as the basic material.

Mr. G. M. GILL, after commenting upon the extraordinary interest of the paper, said that the system described therein had great possibilities, and should enable them to make water gas from an inferior grade of fuel. It seemed to him that it had almost unlimited possibilities. Discussing the details of the system, he said he assumed that the ash left the plant with the gas, and was extracted by the cyclone apparatus. He asked whether the cyclone apparatus extracted all the dust—which he imagined would be in a very fine form—or whether any of the ash passed forward and was used for the subsequent processes. Further, he asked whether any unused coal or coke left the carbonizing or gasifying plant with the gas, or whether it was gasified completely in the reaction cells. Another question was to what extent the steam was decomposed in the reaction cells, and whether much of the steam passed forward to be condensed later. He added that in this country, of course, they had used coke for the making of water gas, for gas undertakings regarded the water gas process as a convenient medium for using up surplus coke, or coke which it might be difficult to dispose of at a good price. In the United States, however, bituminous coal was employed for making water gas, and he imagined that a process in which low-grade powdered coal could be used would be very popular in that country.

Dr. F. S. SINNATT, M.B.E. (Assistant Director of Research, H.M. Fuel Research Station), who had also had the privilege of seeing the plant in operation in Berlin, said he had been very much impressed with the efforts that had been made to keep the plant compact and to apply all the necessary measuring apparatus. It was a really good experimental plant. Commenting on Dr. Thau's statement that the coal used should have very little or no agglutinating power, he supposed the author had meant that a non-caking coal should be used. If that were a limiting factor in this plant, however, its application to the coals of this country might be rather limited, because it was very rarely indeed that their coals had not, at any rate some, caking power. He asked Dr. Thau, therefore, whether a coal containing (say) 10 p.ct. of caking coal would coke, and accumulate in the water gas vessel. He could conceive of a caking coal being used in the water gas producer if means could be adopted by which the caking property could be destroyed as a preliminary, or if the caking coal could be made to form cenospheres before it came into the water gas apparatus.

Mr. T. F. HURLEY, B.Sc. (H.M. Fuel Research Station), in regard to Dr. Thau's suggestion that the heating should be effected by introducing pulverized fuel into the combustion cells, expressed the view that in those circumstances very severe difficulties would arise. In order to ensure the heat transfer, the temperature of the combustion cells would have to be distinctly higher than the temperature of the reaction cell, in which case, of course, there was likely to be trouble due to ash and clinker formation, which so far Dr. Thau had avoided by keeping the temperature below 1200°—the fusion point of the ash. At the Fuel Research Station that difficulty was overcome by making the combustion chamber into a producer, and so keeping the temperature down; but that meant, of course, that the amount of coal and air had to be regulated carefully in order to avoid the deposit of fuel, on the one hand, or, on the other hand, an excessively high temperature.

In the last respect, of course, Dr. Thau would be helped by having to give heat to the water gas and would be able to use rather more air than was being used in the experiments at the Fuel Research Station. As to the use of caking and non-caking coals, he believed it was possible that, if Dr. Thau started with a non-caking coal, and used it until the chamber was thoroughly hot, he could then introduce a caking coal. The formation of coke and its adherence to the walls of the chamber seemed to occur generally during the heating-up period; and it had been found in the course of experiments at the Fuel Research Station that, if coke was allowed to accumulate for a short time while the chamber was getting hot, the tendency for coke to form afterwards was very much reduced. Apart from that, however, coking coal should be quite good in a vortex chamber, because, if it formed cenospheres, the forces on the particles would be such as to cause them to travel inwards rather than outwards, so that their contact with the walls was avoided.

Mr. H. M. RIDGE asked whether it would not be possible to reduce the width of the chamber appreciably. He was assuming, of course, that the brickwork presented no difficulty in this case. The chamber must be constructed with extreme care, but it seemed to him that, if the chamber was made very narrow, there would be a very much quicker and better reaction, and one would thereby largely reduce the risk of carbon particles, which had not been acted upon, going forward and having to be separated in the cyclone.

Mr. H. HOLLINGS (Gas Light and Coke Company), commenting on Dr. Thau's statement that the best results could be obtained when using the German brown coal as a fuel, said it would appear that in that case advantage could be taken of the high reactivity of the fuel towards steam at the reaction temperature, without suffering the disadvantage of the high reactivity towards carbon dioxide, which disadvantage would be suffered if such a fuel was used in the intermittent process so well known in this country. That point naturally led one to consider how far the process would be applicable to coke. He raised the question because in the English gas-works one of the primary reasons for the adoption of the water gas process was that the gas-works might retain control over the coke market; they wished to use coke as a raw material for water gas manufacture in this country. He might be told, of course, that coke could not be used in Dr. Thau's process, because of the difficulty of pulverizing that coke. Another reason for referring to the question of coke utilization was that, if the process was adopted in a gas-works, as suggested in the paper, they would still be faced with the necessity of making a producer gas from coke; and he believed that many English engineers would feel that it was still desirable to use lump coke for that purpose. It had been pointed out that, on the basis of gas volumes, the producer gas plant—which was a necessary auxiliary to this plant—became even larger than the water gas plant itself. He believed there were 134 c.ft. of producer gas to every 100 c.ft. of water gas made.

Dr. R. LESSING first discussed the question of obtaining a suitable fuel for the process described in the paper, because he gathered that Dr. Thau did not fall into the trap—into which so many "saviours" of the fuel industry had fallen in the past—of saying that the process was applicable to the treatment of all fuels. One kind of fuel which seemed admirably adapted for use in this plant was natural coal dust. This material was available in the very physical form in which material had to be applied in this process. By its use one would save the cost of powdering—the capital cost and the operation cost of the milling equipment—the fuel would not be liable to agglutination, and, on the other hand, it had not the disadvantage of the low degree of reactivity that was obtained with powdered coke, if such could be used economically in this particular case. The natural coal dust was available, potentially at any rate, in enormous quantities, and it would be well worthy of consideration. Commenting upon the point made by Mr. Hollings that the British Gas Industry—and most likely foreign gas industries as well—wished to retain their hold on their coke markets, and therefore felt compelled to use coke for water gas production, he said there was a possibility of combining the two by using in this particular way the natural coal dust, which otherwise would go into the coke and swell its tonnage, and carrying on at the same time the ordinary process of water gas production from coke which was undoubtedly highly efficient. This would be a natural corollary to another problem, and that was the cleaning of coal generally, because it had been pointed out that in connection with the preparation of balance-sheets to show the economic significance of this operation upon the carbonization process in gas-works, the disposal of the dust would be a difficult matter at a gas-works. In this process described by Dr. Thau, it seemed that they had a tool by which this could be done.

Emphasizing the importance of the use of clean fuel, he said that, although it had been pointed out that the ordinary intermittent water gas process, if carried out on modern lines, was highly efficient thermally, the efficiency of that process could be still further increased to a very great extent by the use of a low ash coke. In recent large-scale trials it had been found that the gasification efficiency of one particular process could be raised by something of the order of 30 or 35 p.ct., simply by altering the properties of the coke used; and this could be done to advantage under commercial conditions.

In regard to the efficiency of the continuous producer, he said it was of enormous importance, from the designing and operating point of view, to know what were the factors determining the length of path through which the particles would have to pass. The vortex motion was still surrounded by a certain amount of mystery, and generally they did not know exactly for what length of time each particle would stay in the zone in which it was exposed to the highest degree of reaction. It seemed that with various fuels the length of time necessary for the completion of the reaction must differ, and in order to obtain full efficiency and to be quite certain that the carbon in the fuel was used to the greatest possible extent, one had either to extend the length of the oven so far to ensure that it was capable of taking care of even the most refractory of these products (*i.e.*, the one which occupied the longest time to burn), or else one must be satisfied to accept a certain deficiency in the matter of the actual utilization of the carbon.

Mr. JOHN ROBERTS said that he had been using in an open grate in his office one of the Welsh smokeless coals. It was of very low volatile content, and he had expected it to be as absolutely non-coking, as it was absolutely smokeless. From visual examination of specimens it would be thought that one specimen was quite as homogeneous as another, and that they were all from the same seam; but he had found that the behaviour of the different chunks was not exactly the same. Some chunks would decrepitate and open up without coking, while others would form a fairly firm coke. As Dr. Sinnatt had stated, one could expect to get some coking constituents in some of these coals, even though the bulk of the coal might be more or less non-coking. The low-volatile Welsh coal formed an absolutely non-swelling coke, and if the mass was non-swelling—and, of course, there was no shrinkage—then the cenosphere itself was non-swelling, so that it was very small. He suggested to Dr. Thau that, instead of extracting some of the coal particles—they might be cenospheres—and returning them to the reaction chamber, as was his practice, they should be returned to the pulverizer and reduced in size, so that at least a large proportion of them would pass through a 200 mesh.

Dr. M. W. TRAVERS, F.R.S., in a written contribution, said that, in the process of converting coal into water gas in a single operation, he had shown that the carbonization of the coal could not be effected by the sensible heat conveyed to it by the water gas alone, even if the process of gasification of the coke produced from the coal was carried out very efficiently. By some means or other some of the heat carried by the blow

gas must be conveyed to the coal. This conclusion was derived from elementary thermochemical considerations, which did not seem to be appreciated by the Industry most nearly concerned. In the process described by Dr. Thau, the carbonization of the fuel and the heat required to make up the deficiency in the water gas process were supplied from what might be termed an external source, so that, whatever might be the technical difficulties involved in operating it, it did not suffer from the defect which was inherent in many processes which had been patented and tried out in this country, derived from the fact that successful operation could only be achieved by the elimination of the law of the conservation of energy. Further, since in this process the material used on what might be termed the "blow" side of the process was burned almost completely—indeed, as completely as was technically possible—to carbon dioxide and water vapour, and the exchange of heat between the blow and the run processes, which were continuous, could be made very perfect, the "process efficiency"—a term which he had used elsewhere to indicate the extent by which the reactions involved in the process could proceed to equilibrium or to completion—could be very high.

"Plant Efficiency."

The practicability of the process would depend upon what he had termed elsewhere the "plant efficiency"—*i.e.*, a measure of the relative capital cost of a plant required to produce water gas at a certain rate. Experiments carried out at the Fuel Research Station at Greenwich, years ago, showed that by decreasing the rate of output of a standard plant below the normal, the efficiency of gasification of the fuel could be materially increased, or, in other words, that process efficiency could be increased at some sacrifice of plant efficiency. Proper mathematical treatment of the problem would lead to a definition of the most favourable rate of working of water gas plant—a matter to which attention might be directed. In the case of the plant described by Dr. Thau, the practicability of operation on a commercial scale seemed to depend very materially upon the plant efficiency which could be achieved. Sufficient was known about heat exchange in such systems to allow of an estimate being made of the area of surface required for production of unit quantity of water gas.

Since the plant was suited only for gasification of non-caking coals, one must look for the development of it in countries where such fuels were available, and among these were Canada and Australia.

Mr. John L. Strevens also forwarded a written contribution, in which he said that the fact that the economic production of high hydrogen water gas was now possible cheaply and continuously from young high-volatile non-coking or poorly-coking coals by direct action, not only provided an attractive outlet for large quantities of this type of coal, but opened up possibilities of a new gas-making technique which should throw a lesser strain on the good gas coal measures.

Mr. E. Kilburn-Scott said he was not sure that the intermittent method would be beaten by this new method. As a piece of engineering construction, the latter was very much more costly, and, in addition, it was necessary to grind the fuel into a fine state of division—apparently 85 p.ct. had to pass through 100 mesh—and that cost money.

Melting Point of the Ash.

Mr. B. H. Williams (H.M. Fuel Research Station) emphasized the importance of the melting-point of the ash. He pointed out that the heat necessary for the reaction was transmitted through the walls of the reaction vessel, and if there was any deposition of ash in the fused condition on the walls of the reaction vessels. then both the plant efficiency and the process efficiency would be decreased considerably. Therefore, if the melting-point of the ash was below 1200°, as Dr. Thau had mentioned, the temperature at which the reaction occurred would have to be decreased considerably. As a result of that the plant would yield less gas. It was well known that most of our cokes or coals contained ash which fused in an atmosphere of steam. The atmosphere of steam would tend to lower the melting-point of the ash; and he imagined that as a result there would be in most cases a considerable deposition of fused ash on the walls of the generator, which would continue to accumulate. Therefore, he imagined that the output of the plant would vary according to the melting-point of the ash in the coal used, and that to get anything like the results obtained by the ordinary intermittent water gas plant one would be forced to use a coal containing ash of comparatively high melting-point.

Mr. L. H. Sensicle said it seemed to him that, in striving to produce a continuous water gas producer, Dr. Heller had been working on the right lines, although, as Dr. Thau had been careful to state, he had not yet succeeded in evolving a process which was thermally more efficient than the old blow-and-run process. On the other hand, the continuous plant described was admittedly experimental, and it would seem that in the new type of commercial installation suggested, the thermal efficiency might be better than that of the existing blow-and-run system. In his view the disadvantage of the older process was the fact that the composition of the water gas was bound to vary throughout the run, because the temperature of the bed was falling continually. Modern developments of the older process had reduced that disadvantage so far as was practicable by shortening the run, this being achieved by adopting mechanical methods of operation; but he still believed that a continuous method of operation, in which the heat was transmitted from an external source, was the ideal to be aimed at. In that connection it was rather disappointing to know that the percentage of carbon dioxide in the gases which had been made in the plant described by Dr. Thau was as high as 7 p.ct. The great advantage one would expect from the continuous process would be the ability to reduce the inerts, theoretically at any rate, to a lower figure than with the old intermittent process; and it seemed in this direction that the great advantage of the system would have to be sought in the future. It appeared obvious that the temperature attained by the carbonaceous matter in the reaction chamber was insufficient, as was indicated by the high percentage of carbon dioxide, or else the 7 or 8 seconds period of contact was not sufficiently long.

The Author's Reply.

Dr. Thau, replying to the discussion, promised to convey to the I.G. Farbenindustrie the desire, expressed by the Chairman, that they should publish a paper relating to the Winkler producers at Leuna. Such a paper would be very interesting. The cyclone dust extractor did not extract all the dust. The reactions in the plant did not allow the dust to come to rest, so that roughly only about 10 p.ct. of the dust carried away in the gas was extracted by the cyclone extractor, while 90 p.ct. of the dust was caught in the centrifugal washer. Replying to the question as to whether the small traces of dust in the gas contained coal, he said he had thought that, as the dust was carried away by the gas, there would be a separation effect such as that experienced in pneumatic coal washing—the lighter particles of carbon being carried away and the heavier ash particles remaining. And he had found, when dealing with the gas in a Soxhlet filter, that the material retained in the filter was so fine that it could almost be called colloidal, and that it did contain a little more carbon than did the average ash. The problem of the undecomposed steam in the gas had been examined, and this raised the question of the carbon dioxide in the gas. It was necessary to choose between working with a large excess of steam (which increased the carbon dioxide content), or running the risk of having too little, in which latter case the reaction would not be complete. Therefore, a compromise had been arrived at by working with as small an excess of steam as possible, and keeping the carbon dioxide content of the gas as low as possible.

If he were to relate his experiences in regard to the coking properties of the fuel used, he would have to make use of some very un-Parliamentary language. He could not make a careful selection of the coal in the ground condition before buying it, because he could not find a colliery willing to grind 10 tons of coal and pack it into paper bags. He had had to find a colliery concern which would promise that its coal was non-coking; but, in fact, it did coke. In the course of his experiments he had thought of superheating the steam and destroying the coking properties of the coal before it entered the cell; but when he had done that he had found that the coal had simply coked up the tube through which it had to pass. Unfortunately, the non-coking coals were of the geologically older types—*i.e.*, nearer the anthracite, and the nearer they were to the anthracite the less reactive they were. He had lately obtained a coal which was drawn off pneumatically, in the washery, from Upper Silesian coal which did not coke. He had made a qualitative analysis of every bag of the coal before accepting it, and he hoped to try the coal in the near future. He admitted that, since it was much easier to make a coking coal non-coking than to make a non-coking coal coking, there was something to be said for using a plant to destroy the coking properties, though he had not been able to do that with his plant.

With regard to the dimensions of the chambers, he said they were mainly the result of compromise. He was inclined to think that, the smaller the chamber, the better would be the transmission of heat. Dr. Heller had held, however, that this was not a matter of transmission, but of radiation—and for radiation, of course, it was an advantage to make the cells a little wider, quite apart from accessibility, which was of secondary importance. As to the speed necessary to convert a piece of carbon, in the presence of superheated steam, into water gas, it was believed that it would be an advantage to increase the diameter of the gasifying cells from 10 ft. 6 in. to 16 ft., and there was reason to believe that the results would be better.

The best fuel he had found for use in this plant was brown coal coke, which was a very reactive fuel. The utilization of gas coke smalls had been tried for a period of a day. The dust was tried first. The fines were screened out, and the residue from the screening was ground. He had obtained a grey and a black dust. The grey dust contained 50 p.ct., and the black dust contained 25 p.ct., of ash, so that he believed the grey dust was mainly decomposed carbon from the coke. This material did not lend itself well to reaction, and had yielded only about half the amount of gas that was obtained from coal or brown coal coke. Whether or not the other portion of the coke dust would give better results he had not yet been able to ascertain.

Powdered Fuel for Heating the Cells.

He was thinking of using powdered fuel for heating the cells of the producer. Again, it would not be very difficult to heat by means of an ordinary breeze producer utilizing small coke, although, obviously, that would enlarge the plant. The rate at which the fuel particles travelled through the cells was not easily determined. The only means he had was to note, when changing the fuel, the time which elapsed before the particular class of fuel appeared at the end of the water gas main, and from that he had calculated the speed. It was not a reliable test, but it was the only means he had.

Anyone who had seen the plant would be rash to suggest that the ash from the cyclone should be returned to the mill, because the ash coming from the producer was like activated carbon.

If anybody coughed, the whole place was in darkness [Laughter], and the material coming from the washer was so fine that filtering was necessary to recover it.

He was glad that attention had been drawn to the alteration of the melting-point of ash in the presence of steam; he would certainly watch that matter in the course of the trials. Every time the producer had been shut down, the cells had been inspected from inside, but there was nothing on the walls except a little dust, which, when touched with a soft brush, would fall away. If the walls became covered with running slag due to a low melting-point ash, naturally the heat transmission would be reduced, but that trouble had not been experienced in this plant. Near Berlin there was a great deal of brown coal and lignite; and there were also rather large salt deposits. In some places the brown coal was contaminated with the salt to such an extent that he could not use it at all, and before he determined the melting-point of the ash, he determined the water-soluble constituents of the ash, which gave a guide. If there was a great deal of salt in it, which dissolved in water, it was not necessary to test the melting-point of the ash, because he knew that the coal could not be used for ordinary purposes. Fortunately, however, he had not experienced such coal so far.

As to the criticism that the efficiency of this plant was not greater than that of the normal water gas producer, he agreed that so far it was not, but he had indicated where the faults lay; and they knew very well by calculation how much the loss of heat by radiation could be reduced. He was quite sure that the efficiency would ultimately be slightly better than that of the other process. However, assuming the same efficiency, and knowing that the labour costs were the same, saving was effected by the use of a cheaper fuel. So many processes had been developed since the war for the use of low-grade fuels that they would have to find a means for using the good fuels; otherwise there would be no further demand for them, and consequently there would be no cheap fuels. The conditions in Germany were peculiar, having regard to the deposits of brown coal, which lent itself very much to use in this process; and such conditions also applied in British Colonies. But he suggested that for English conditions it would be best to try the use of the ordinary coal.

Wales and Monmouthshire Institution

(Concluded from last week's issue of the " JOURNAL.")

GAS FOR TRADE AND INDUSTRIAL PURPOSES

Below we resume our report of the Twenty-Sixth Annual Meeting of the Wales and Monmouthshire Institution of Gas Engineers and Managers, which took place in Cardiff on May 21, under the Presidency of Mr. OCTAVIUS THOMAS, of Pentre.

ELECTION OF OFFICERS, 1931-32.

President.—Mr. E. Ablett (Swansea).
Vice-President.—Mr. I. G. Jenkins (Abertillery).
Members of Council.—Messrs. J. F. Rust (Newport) and H. Matterface (Monmouth).
Treasurer.—Mr. J. H. Canning (Newport).
Hon. Secretary.—Mr. Octavius Thomas (Pentre).
Hon. Auditors.—Messrs. L. W. Nuttall (Pembroke Dock) and B. Taylor (Treharris).

INSTITUTION BENEVOLENT FUND.

Proposed by the President and seconded by Mr. W. Clark Jackson, it was agreed to subscribe ten guineas to the Benevolent Fund of the Institution of Gas Engineers.

SOME NOTES ON THE APPLICATION OF GAS FOR TRADE AND INDUSTRIAL PURPOSES.

By B. J. BELL, of the Cardiff Gas Light and Coke Company.

When the use of gas for industrial purposes is mentioned, it is generally inferred that the term applies to large-scale operations only, and that the possibilities of development in this direction are strictly confined to manufacturing centres. While it is true that huge consumptions are obtainable where metal working is the predominant commercial activity, heat treatment of materials is so common that it is carried on everywhere in some form as one of the processes of business enterprise.

In some areas the opportunities seem so limited that it appears hardly worth attempting development. Herein lies a dangerous temptation to take too narrow a view of the position. Such areas may be considered the zero mark of prospective consumption, but it is not the actual possibilities of to-day that will determine the ultimate results. As the horizon broadens, further possibilities will be available, but unless undertakings gradually expand by taking advantage of every prospect as it arises, however small, the value of the building up process will be lost. It will be well to analyze the problem carefully because it is evident that the term "Industrial Gas" has misled, if not actually frightened, those who, so far, have given little thought to the matter.

"ZERO" AREAS.

Although the possibilities open to some undertakings may be viewed with envy, there is no reason for a negative attitude even in the zero areas. It is well to remember that there is a quarter of a century's experience and specialization behind those successful industrial gas loads, and it cannot be expected that less fortunately situated undertakings can hope to make headway, even within the limits of their prospects, without corresponding effort. Neither should it be concluded that because obvious loads are unobtainable to-day, they will for ever be out of reach.

The vision must be for the future. Every step tending towards satisfactory utilization of gas in industry, however small the present consumption may be, will inevitably lead to further development, probably through most unexpected avenues. Persistent efforts must be made now and without delay, because, as is well known, other fuels are competing and determined efforts are being made to secure the market. If we do not even attempt to secure the business, the probability is that the position will be less advantageous as time goes on.

It is admitted that the price factor is important, especially where solid fuel is concerned. Big loads have to be refused as unremunerative at present, but as investigation proceeds it is quite possible that the difficulty will be considerably modified. The Gas Industry has attacked other vital problems successfully, and certainly is not leaving this important matter to chance, but is persistently working towards a solution.

THE JOB AND THE MAN.

First it is necessary to determine the prospects. Only long and arduous cultivation of probable consumers and their requirements will prove productive, and much unremunerative and disappointing experimental and demonstration work has to be undertaken before commercial success can be expected. Where the "millions per annum" load is hard to come by, the few feet per hour consumer must be carefully sought out and cultivated.

This entails a careful survey, to ascertain where such activity will be repaid. After this it is necessary to embark upon a canvass. The procedure is necessary in order to obtain exact information as to (1) where heat is already being employed, and (2) where gas heat is applicable. In the former circumstances, gas possibly can be used advantageously in place of some other fuel, and in the latter it may be possible to encourage its use by suggesting processes or operations where gas heat would be appreciated.

A casual review might incline to the opinion that further efforts would be unnecessary and non-productive, but this would be a false premise, derived from insufficient information. It must be admitted that sometimes canvassing will prove disappointing, but, on the other hand, surprisingly good results will be secured from unexpected sources. To illustrate this it may be mentioned that a recent canvass among wireless concerns proved negative owing to the trade in this district being distributive only, while it proved fruitful among garage proprietors, both in discovering that gas is already extensively used, and also providing a source of potential business.

It must be realized, however, that it is not good practice to send out untrained representatives on this work. Information, apparently reliable, may be obtained by men who have no special qualification. Actually, however, the value of the canvass does not lie so much in the obvious business to be secured as in the less obvious possibilities of output which a knowledge of processes and methods will suggest to a trained mind. Propositions of this kind often mature, and consumers adopt gas firing to the mutual advantage of themselves and the undertaking.

Large undertakings situated in industrial areas find it possible to employ physicists of wide scientific attainments, and these officers prove a sound financial investment where their highly specialized training and knowledge can be fully utilized. While the goodwill, so marked in the In-

dustry, has made it possible for less fortunate undertakings to take advantage of the experience and information of such expert knowledge, there is, of course, a limit to the application of such services as are available. Consequently there is a distinct opening in the Industry for young men possessing good technical knowledge, combined with workshop practice. Such scientific attainments as can be easily secured at our Technical Colleges, and practical experience combined with sound commonsense, are ample equipment with which to tackle all the usual problems likely to be presented by potential trade and industrial concerns.

It is, of course, necessary that there should be an industrial showroom and laboratory, so that demonstrations may be given and experimental work conducted. Perhaps it cannot be expected that every undertaking should provide even the minimum personnel and equipment, but the trend of recent organization within the Industry will make this unnecessary, and at the same time prevent any complaint or excuse for inactivity.

A Co-operative Scheme.

The scheme of the Committee of the National Gas Council provides a means whereby every undertaking will be able, by arrangement, to avail themselves of the pooled experience of the use of gas for industrial purposes. Each selected centre will be the source of information for its district, and each centre will arrange for specialist visits, or give information when consulted by any qualifying undertaking.

Naturally the value of such an arrangement to undertakings depends entirely upon the use made of the facilities provided by the scheme. As has already been announced, Cardiff is to be the centre for the district represented by your Association, and already an industrial showroom and laboratory have been equipped.

In the past there has been a tendency to take advantage of the manufacturers' selling organization, but this is unfair and undesirable. Unfair because the manufacturer has to take his profits from his sale, and the extent of the service which can be rendered is distinctly limited. The expense of the service expected often far outweighs the reasonable margin derived from the actual sale. This is generally true for all small jobs, but naturally tends to be less important as the propositions increase in magnitude, but it is even then undesirable, for, although manufacturers are distinctly fair, they are not gas but furnace specialists, and they cannot be expected to lose a profitable sale because they are limited to one particular fuel. Therefore it is imperative that the preliminary work in the case of large propositions should be managed by undertakings themselves, if necessary through the appointed centre, and small industrial prospects which do not involve manufacturers should be definitely carried to a successful conclusion. Sufficient has been said to prove the value and utility of the organization within the Industry, and the desirability of fully supporting the scheme and utilizing the facilities which are being provided.

Efforts in Cardiff.

It will be gathered that, in Cardiff, a determined effort is being made to secure the advantages of the gas load for trade and industrial purposes, and a stage has now been reached when it is possible to visualize the promise for the future.

After long training with practical experience in testing and experimental work, the personnel allocated for specialization are exploring every avenue of potential consumption, as well as keeping in touch with actual users. Although not finally completed, an Industrial Showroom has been inaugurated and is equipped with typical furnaces and appliances for exhibition and demonstration. Already the space originally allocated has proved to be inadequate, and extensions are in hand. All this enables consumers to obtain practical information, and this is assisting to bring industrial selling to the high level reached by the domestic sales force.

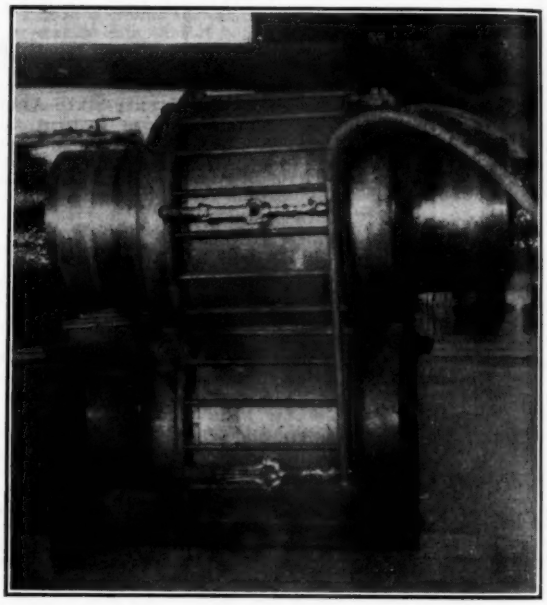
There is, of course, already a substantial industrial load, and gas is extensively used in newspaper offices for metal melting and other purposes, as well as for activities such as tool hardening, sugar boiling, steam raising for cooking, and in many other spheres. It may be interesting, however, to mention a few of the recent applications we have been called upon to investigate and advise upon.

In tinplate works 30-lb. to 40-lb. billets are heated up in the furnace and rolled in stages (1 roughing and 4 finishing) to the required size and thickness in a process known as hot rolling.

The rolls for this work are housed in a massive cast-iron frame, and are 22, 24, or 28 in. in diameter, weighing approximately 2 tons 3 cwt., 2 tons 15 cwt., and 3 tons 5 cwt. respectively per roll.

At the end of the week these rolls have to be turned slightly concave in order to allow for expansion due to the heating up when the hot metal passes through the rollers. After the rolls have been turned up at the week-ends there is a long period after the start on Monday morning before they have fully expanded, and narrow sheets are worked until the proper heat has been reached in the rolls. It is desirable to prevent this production of unnecessary sheets by heating up the rolls to the required temperature, so that rolling could be started first thing on Monday morning, instead of wasting about 8 hours of the men's time and a considerable amount of material.

The proposition had already been carried out by impinging a flame upon the rolls, but this necessitated continuous rotation during the process, involving loss in power charges and supervision. As the rolls are very costly, we were instructed that, in order to prevent uneven heating, 6 hours was the minimum time which should be allowed for the process. To obviate accident, experiments were first undertaken with the rolls rotating, but from the experience gained it was considered feasible to carry out the required operation with the rolls stationary. High-pressure gas was used for the purpose, and this was applied through a specially constructed casing which acted as an insulator and at the same time carried the burner nozzles.



Tinplate Mill Roll Heater.

These nozzles were placed 3 in. apart, and so arranged that even heating was given throughout the surface of the two rolls; and in trying out this equipment some interesting information was obtained. Fluctuations in heat between the upper and lower rolls were noticed and adjustments in the number of nozzles made accordingly. In the final experiments it was found that the 24-in. rolls could be heated to the required temperature (325° C.), on the face centre, in 6 hours with a consumption of 2400 c.ft.

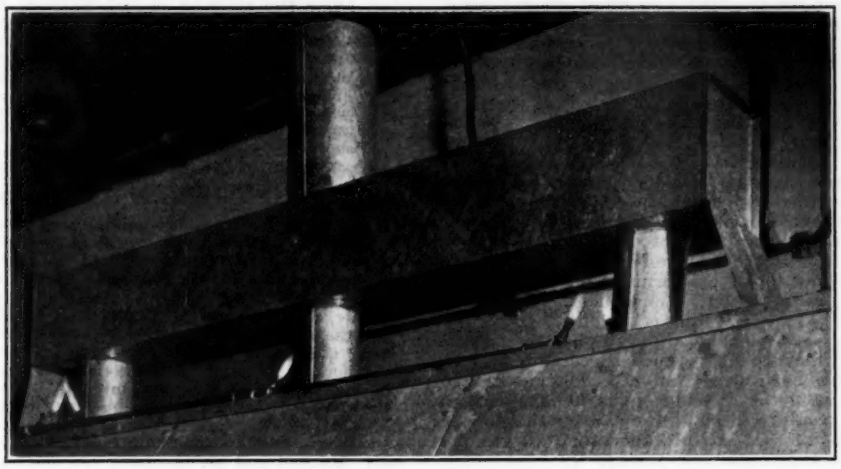
As these experiments could be carried out only at the week-ends and at intervals by arrangement it will be realized that considerable time elapsed between the first and final tests, but the work was eventually expedited by the erection of rolls in a temporary housing.

The following are the temperatures obtained under working conditions:

—	Top Roll.		Bottom Roll.		Remarks.
	Left Hand.	Right Hand.	Left Hand.	Right Hand.	
After 1 hour . .	50	50	35	35	..
,, 2 ,, . .	80	80	55	55	..
,, 3 ,, . .	120	120	80	80	*
,, 4 ,, . .	130	130	140	140	†
,, 5 ,, . .	160	150	170	150	†
,, 5½ ,, . .	180	180	180	180	†
,, 6 ,, . .	200	200	200	200	..

* = Gas increased on bottom roll.
† = Gas reduced on bottom roll.

All temperatures are in degrees Centigrade, and were taken on the radius of the neck of the roll.



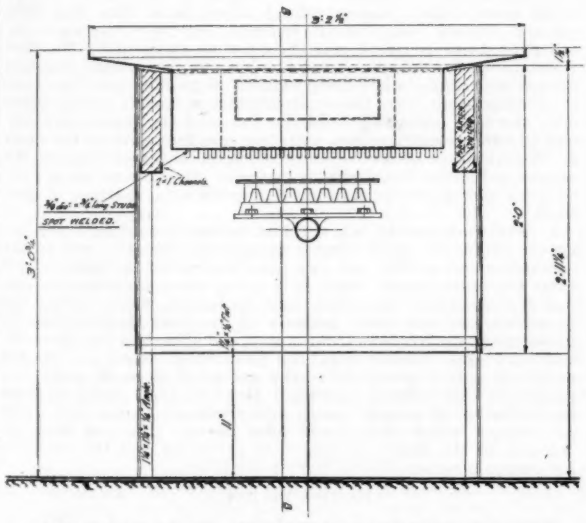
TOP OF FILM DRYING CABINET.

After the burner equipment had been dismantled, the temperature on the centre face of both rolls registered 325° C. At the completion of the heating up the rolls were removed from their temporary housing, and placed in the frame under working conditions.

It was gratifying to find that rolling could commence immediately the gas heated roll was in position, and satisfactory work was turned out.

Potato Crisps.

On another occasion a query was raised regarding the method of cooking potato crisps, as the venture in this district was new and the process of manufacture peculiar to itself. It was found under test that the usual fish frying conditions did not apply in this case. The necessity for even cooking and consistent colour throughout different batches was emphasized, and it was further required that the period between the batches should be as short as possible.



Potato Crisp Frying Stove designed by the Cardiff Gas Company.

The work done on this inquiry proved exceedingly interesting in results, owing to the comparisons obtained under working conditions between flat and studded bottom pans. The consumer had already done some work in investigating conditions and consumptions, and had come to the conclusion that 1000 c.ft. of gas was required to cook 1 cwt. of crisps. Eventually a special pan and equipment were designed in which a Davis fish frying burner was used. The results, as the following figures will show, proved very satisfactory:

Studded Bottom Pans.

Time taken to heat the oil from 60° Fahr. to 400° Fahr. .	17 mins.
,, ,, ,, cook 6½ lbs. of crisps	4½ ,,
,, ,, ,, heat oil up to 400° Fahr. between cooking	5 ,,

Gas rate, 200 c.ft. per hour. Pressure, 30 tenths.
Cooked ½ cwt. potato crisps in 1 hour 20 minutes, using 260 c.ft. of gas.

Flat Bottom Pan.

Time taken to cook 6½ lbs. of crisps	8 mins.
,, ,, ,, heat up oil up to 400° Fahr. between cooking	8–10 ,,

Gas rate per hour, 200 c.ft. Pressure, 30 tenths.
Cooked ½ cwt. potato crisps in 2 hours 15 minutes, using 450 c.ft. of gas.

This test was carried out at the crisp factory.

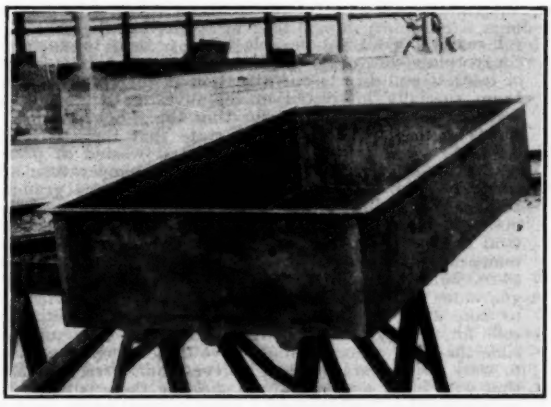
Films and Prints.

Another unexpected inquiry was received from a firm who specialize in the development of films and making of prints in a wholesale capacity. They required a film drying cabinet, but were not satisfied with any of the designs on the market. In this case we made burners to meet their requirements, and the appliance as a whole presents no important features except that gas displaced electric motors for inducing a circulation of air through the cabinet. With this cabinet 150 lengths of film can be dried at one time and the consumption is 80-100 c.ft. per hour.

Drying of Herbs.

Only within the last few days another unusual inquiry was received. In this case the consumer desired to prepare herbs under exacting conditions, to ensure correct drying without contamination.

The specification for the oven stipulates that it is to be 42 in. by 36 in. by 30 in., and must be externally heated, and in addition thermostatically controlled in order to have the right drying temperature. The requirements further stated that the inner lining must be of stainless metal; and finally it was stated that electricity also was being considered for the purpose.



Bitumen Pan.

The complete control of fuel in this case gave us a decided advantage, and we are now proceeding to make up this particular appliance.

The other two propositions in hand are in connection with the heating of a wax mixture for a firm of battery repairers and the heating of bitumen for brattice cloth makers.

In the former case the quantities required are not great, but restrictions for safety have to be complied with. Where the bitumen is required in the process of making brattice cloth 10 cwt. per hour is the expected output. In this case difficulty was experienced owing to the fact that, after melting, the temperature ran so high that the liquefied bitumen proved too thin for the purpose. As the maximum temperature needed was 160° Fahr. it was necessary to run the material, as soon as it was liquefied in the melting tank, into a subsidiary tank, to prevent over-heating. For the first operation a special pan was designed and constructed. In this the liquefied bitumen is collected in channels at the bottom of the pan, and immediately run off. If the bitumen is allowed to remain in the flat bottom pan, pools are formed, and the material cannot find a path to the outlet. Consequently these reach a high temperature before the bulk is liquefied.

Special provision was made in order to obviate the difficulty. So far the method has proved successful, and the gas consumption has been nearly halved. The gas rate for melting bitumen under these conditions is 60 c.ft. per cwt. but more definite results will be obtained after the pan has been moved from the industrial laboratory to its permanent position at the consumers' works.

These jobs have been mentioned to illustrate the fact that, once having organized for industrial work inquiries are unearthed by canvassing which would not otherwise be received. The instances given are not claimed as anything extraordinary either in design or in results, but are sufficient to show that the industrial load is not stereotyped business where the inquiry can be satisfied by standard appliances giving proved results. Probably it may be considered that the actual consumption is not an adequate return for the experimental and other work expended; but the point it is desired to emphasize is that, as progress is made, more consumer confidence is engendered. Gradually consumers become aware that there is a useful service at their disposal, and are more and more inclined to put their industrial problems in the hands of the Gas Company.

One thing leads to another; and while the same rapid development as is experienced in other directions cannot be expected, it is evident that headway is being made. When considering future policy in connection with the use of gas in trade and industry, the experience and information gained from experience will be invaluable. The idea of gradually building up from the small things is bound to prove beneficial. Eventually the bigger loads come along, and can be handled with certainty. Where obstacles such as price and other local considerations enter into the question, the knowledge gained through experience enables a decision to be arrived at which otherwise would have been difficult owing to lack of sufficient data.

In conclusion, while I thank the Engineer and Manager—Mr. H. D. Madden—for permission to give this paper, I must apologize for its incompleteness; but as a very short time was allowed for the preparation of this communication, I am sure you will grant me your indulgence on this occasion.

Discussion.

The PRESIDENT announced that he had received the following letter from Mr. Harold Barker, the Manager and Secretary of the Llanelly Gas Light Company, on the subject matter of the paper:

> I regret I shall not be able to be present to-morrow to congratulate you personally on your paper. It is brimful of interest and directs our attention in the right direction. I am specially interested in the investigations you have made and advised upon respecting the "hot rolling" of sheets in tinplate works. You state that there is a considerable amount of time and material wasted at present in heating-up the rolls to the required temperature after turning. Am I correct in saying that this is gradually attained by rolling "odd sizes" (for which there is a market), and that it depends entirely on the skill and practical knowledge of the workman to say when the requisite temperature has arrived to enable him to start working the 28-in. billet? And it would be interesting to know what guarantee he would have that everything was quite ready to take away the insulated casing and start rotating the rolls for this size if gas heating was used. It is quite possible that the workman would have to be specially educated to work to temperatures. I believe I am correct in saying that with black and galvanized sheeting there is practically no market for "odd sizes." Your suggestion to heat the rolls in a temporary housing, and when hot enough to remove them into the frame ready for working, would, I fear, demand more than ordinary care. I take it that the rolls are turned at present in their working position and accurately adjusted top and bottom; and it would only be in works which were absolutely "up-to-date" with lifting tackle and plant, and even then only with the exercise of extreme care in re-adjusting, that replacing from a temporary housing could be carried out expeditiously. I should think that the chill of each roll would also have to be borne in mind. Gas heating might assist, however, by permitting automatic greasing of the bearings, which, I understand, is rather difficult at present. Of course, in tinplate works as in gas-works, there are different conditions of working and also different conditions of plant, some more up-to-date than others; and naturally what would suit one works might have to be altered for others. On some future occasion, if I may be permitted, I should like to see the apparatus being worked, for if it proves a success there should be a large field for us in South Wales generally and especially in "Tinoppolis."

PREVENTION OF OVERLAPPING.

Mr. J. H. CANNING (Newport) congratulated Mr. Bell upon having presented an admirable paper. The members of the Association were certainly grateful to him for having presented such an important and practical contribution to the proceedings of the Association. He (Mr. Canning) also wished to pay tribute to Mr. Madden and the Cardiff Gas Light and Coke Company for the splendid work which they had initiated in connection with the use of gas for trade and industrial purposes in that district. Mr. Madden and the Company had given the members of the Association the opportunity of seeing the valuable work they were doing, and they had been most generous in placing all the available information at the disposal of those requiring it. All of the members of the Association were indebted to Mr. Madden and his Company for what they were doing, and all of them should benefit by it. One important thing which would arise out of that discussion in relation to the necessity for organized research was that steps should be taken for the prevention of overlapping. That was of great importance, for unless they organized quickly there was a danger of persons working independently on parallel lines, and then, however valuable the work might be, there would be the danger of delay. And it was vital that there should not be any delay in endeavouring to secure the industrial field for gas as quickly as possible. Every day was of importance to gas, for other fuels and agencies were in the field, and unless they acted quickly they might find the ground occupied before they got to it. It was of the utmost importance, too, that in the matter under discussion the Gas Industry should be united, and that the smaller undertakings, equally with the larger undertakings, should be informed of the developments, possibilities, and results of the research work. His view was that it was as important for the small organization to know what the position was as it was for the large undertakings to be informed of what was happening. The price factor, to which Mr. Bell had referred, was another point of importance. At present the Gas Industry had not the same liberty which was enjoyed by its competitors. Those of them who were in the Gas Industry were apt to look only at the position in the electrical industry—which had great liberty in its powers in regard to charges, whereas the Gas Industry was tied hand and foot—though there were other persons selling other fuels who had even greater liberty than that enjoyed by the electrical industry. However great was the freedom enjoyed by the electrical industry, it was at least subjected to certain statutory obligations, while other fuels were to a great extent free from such obligations. In those circumstances it was to be hoped that the Gas Industry would not cease in its endeavours continually to present its case, agitating and knocking at the doors of Whitehall in order to impress upon the Government the necessity for the Gas Industry to enjoy at least as much freedom as was given to its chief competitor in matters of that kind.

If they went closely into the matter they would find that the actual extent to which electricity entered into the cost of the production of articles—at any rate the larger articles—varied from 1 to 3 p.ct. only, while in a great many industries in this country—industries in which heat treatment was required and in which gas was used because of its easy application, its uniformity, its freedom from waste and dirt and its other advantages—gas entered into the production costs not to the extent of only 3 p.ct., but to the extent of 20 or 30 p.ct. Gas producers everywhere, continued Mr. Canning, ought to draw the attention of manufacturers and producers to the very great advantages which they could offer them. He had been interested in Mr. Bell's references to personnel and the necessity for common-sense.

HEATING OF ROLLS.

Proceeding, Mr. Canning said that he had had a little experience of the heating of rolls, though his experience had been on somewhat different lines from those which Mr. Bell had described. The rolls which he had had to heat were five times as heavy as those to which Mr. Bell had referred. His (Mr. Canning's) rolls were very long, and, after considerable experiment, he had found it best—and the men working the rolls had also preferred it—to keep the rolls slowly revolving during the heating. He had done that heating with two burners on each side, under pressure, giving fan-shaped flames, and staggered on each side so as to give equal heating around the rolls. The results he had obtained approximated closely to those obtained from the method which Mr. Bell had described; but, whereas Mr. Bell had found that his rolls could be heated to the required temperature in six hours with a consumption of 2400 c.ft. of gas, the consumption of gas for the heating of the larger rolls was 14,000 c.ft. In his (Mr. Canning's) case the results had also given satisfaction to the men working the rolls, while the management of the undertaking had found that they were able to work an extra shift per week through having the rolls heated in that way from midnight, thus enabling a start to be made on the Monday mornings. But rolls

cost hundreds of pounds, and the management had found that the liability of the rolls to fracture was much less when they were heated by the method described by Mr. Barker than when they were heated by the other method. In other words, they found that any uneven heating of the rolls led to fractures.

He had also had experience in the drying of films and prints. In the case he had had to deal with the firm concerned had originally used electrical heating, but had found that method of heating unsuitable owing to its slowness and costliness. That work was now being done successfully and economically by gas. Towards the end of his paper Mr. Bell had remarked "Probably it may be considered that the actual consumption is not an adequate return for the experimental and other work expended," and, in that connection, he desired to point out that once they had obtained the consumption, if they took care of it, it went on indefinitely year after year, and for that reason no initial pains taken to secure valuable consumptions of the kinds indicated could be too great.

The PRESIDENT then formally welcomed Mr. J. C. Walker, Secretary and Assistant Manager of the B.C.G.A., and invited him to contribute towards the debate.

THE POTENTIALITIES OF GAS.

Mr. WALKER said the paper which Mr. Bell had read was an admirable one, and though the author had apologized for what he considered the inadequacy of the paper, the fact was that he had given a comprehensive account of a highly interesting subject. When they considered that there were something like 3000 known trades with an average application of seven uses for gas in each, they could form some idea of the remarkable potentialities of the industrial gas load. He quite agreed with Mr. Bell and Mr. Canning that every undertaking should make a start in the industrial sphere, and that there was no reason why any of them should be frightened by the magnitude of the task in tackling the industrial load. He had heard accounts of undertakings in which the industrial loads had been small—small because they had been neglected in the past and because of the lack of knowledge as to the possibility of expansion—and in which the intensive training of a bright young salesman had proved to be all that was necessary for the first tackling of propositions which had yielded splendid results. It was, of course, true that when they came to handling some of the jobs which were handled in Birmingham and in the steel-making at Sheffield, they required the highly specialized knowledge of the expert; but in other districts there were hundreds of cases in which gas could be usefully employed for trade purposes, and in which there was not the same call for such a high degree of technical ability as in the places named. He thought, too, that Mr. Bell had rightly outlined the structure upon which the organization of the industrial load should be built. The B.C.G.A. had gone thoroughly into the matter of the sale of gas for industrial purposes, and at Grosvenor Gardens the Association had an analysis of 3000 trades in which were set out the particular purposes for which gas could be utilized; and, while the Association was not in a position to provide every undertaking with that large volume of information, it was all available to any undertaking seeking such information. He was certain, too, that until they had seen and analyzed the position they could have no idea of the many ways in which gas was applied in the preparation and final production of many products. In the case of the manufacture of confectionery, for example, they would all expect that gas could be used for sugar boiling, and they could possibly be pardoned if they imagined that the use of gas in the manufacture of confectionery began and ended with its use in sugar boiling. But, in the volume of information to which he had referred, they would find that there were six to ten different uses to which gas could be put in connection with manufacture of confectionery. For example, the confectionery trade required apparatus for the drying and washing of the bottles in which the sweets were placed, while it also wanted apparatus for the boiling and making of paste for the sticking of labels on to the bottles. He therefore recommended anyone who wanted information as to the way gas could be applied for various business purposes to apply to his Association, who would be delighted to supply the information asked for.

CENTRES FOR RESEARCH.

Continuing, Mr. Walker said that Mr. Bell had referred to the fact that the National Gas Council was in consultation with all the districts with regard to the setting-up of centres at which research was to be conducted, and through which information would become available in the various districts. He (Mr. Walker) desired to add that those centres would in turn pool their information with a central body in London, and that that body would distribute the information to the undertakings and its members in the country. Potential industrial salesmen and the men handling the potential industrial load would be able to obtain information of value from that source, and they should recognize that no industrial salesman could afford to be without the most up-to-date information, and also that the Technical Press, the organs which served the various industries, frequently contained masses of information with which it was desirable that the industrial gas salesman should be in touch.

He had paid a brief visit to the works of the Cardiff Gas Light and Coke Company, and he desired to congratulate the Company and its Engineer and Manager, Mr. Madden, upon the steps which they had taken with a view to encouraging the industrial use of gas. He had been particularly interested, too, in the examples given by Mr. Bell of the uses to which gas could be put in industry, and especially had he been interested in the matter of the potato crisps, for he remembered what happened when that industry commenced in London. He regarded it as a matter of interest and gratification that the use of gas in that particular trade had been made possible through the experiments which had been conducted in the laboratories of the Gas Light and Coke Company. That was one of the instances in which the information and the results obtained from research and experiment carried out for the Industry were made available to everybody who had to tackle the problem in other districts. Mr. Bell had referred to the need for engendering "consumer confidence," while Mr. Canning had referred to the need for a united international front. The point he (Mr. Walker) desired to make in that connection was that a satisfied manufacturer who used gas for his heat treatment in Cardiff was a potential consumer of gas wherever else he might establish a factory. On the other hand, if they had a dissatisfied consumer of gas in Cardiff, and he established a factory elsewhere, the chances were that he would not use gas in the other area. The clear duty of all of them was to maintain the industrial loads on the highest possible plane.

A QUESTIONNAIRE.

Mr. W. CLARK JACKSON (Neath) expressed his thanks to Mr. Bell for his paper. The sense of responsibility of all who were connected with the Gas Industry had been developed by the actions of the National Gas Council, and especially so since that Council had initiated work in areas other than those of Birmingham and Sheffield. In their own district they were all indebted to the Cardiff Gas Light and Coke Company for the attitude they had adopted in that important matter, for the Company and the Manager, Mr. Madden, had arranged to give them the services which they required, and at a rate of payment which would stand as a minimum for the country. He (Mr. Jackson) had issued a questionnaire on the subject for that district, and many of them would be surprised when they saw the many answers, which showed how much of the potential industrial business was likely to be developed. Any man who was working in a small district who sought to apply himself to a question like that of the potential industrial load was restricted in his opportunities for getting to the bottom of the matter. He lacked the staff time, and money necessary for the realization of his purpose; but with a laboratory such as Mr. Madden had established at Cardiff—and they were all able to take advantage of that laboratory and the scientific results of that laboratory simply by contributing a small sum per annum—they were assured of the greatest possible service.

Mr. H. D. MADDEN, in proposing a vote of thanks to Mr. Bell for his paper, remarked that it was only on the previous Thursday that Mr. Bell had consented to read the paper. Mr. Octavius Thomas had found himself in a difficulty in being without a paper for that meeting, and when Mr. Bell agreed to provide the paper he (Mr. Bell) worked with such a will that the paper was in the hands of the printers by Monday. The subject-matter of the paper was one in which he (Mr. Madden) took a great deal of interest, and the experience he had had in regard to it had shown him the great possibility of developments in matters both large and small. For example, he had quite recently been asked to supply tailors with heat for their irons, and that had been successfully done. They had to realize that gas must be used economically—that they had to apply the gas where it would give the highest thermal efficiency. As regards the cooking of the potato crisps, the problem which they had had to overcome in the laboratory was that of preventing the loss of heat when the cold and wet potatoes were placed in the pan in the place of the potatoes which had been cooked, and that problem had been solved by the use of the studs on the bottom of the pans as heat reservoirs. In conclusion Mr. Madden said he had found the information given in American gas papers of considerable value on a number of occasions. Americans had been responsible for wonderful developments in the application of gas to industry, and it was therefore worth while watching what they were doing.

"WASTERS."

Mr. J. MOGFORD (Cardiff), seconding the motion, said that without a doubt there was a very wide field for the use of gas in the tinplate industry. He had spent many years among tinplate works, and he had some knowledge of the processes and of what was required. During the manufacture of tinplates, a number of what were called "wasters" were produced. Those "wasters" were graded, but they were not what the manufacturers wanted. The troubles which produced these "wasters" were principally due to (1) having to start operations at the beginning of the week with rolls that were cold; (2) to oxidation during the annealing process; and (3) the actual tinning process. In each case gas could come to the rescue. Mr. Bell had told them of a process which had been applied to the rolls, and that reminded him of an experiment with which he had been in touch fifteen years ago in connection with a large installation at a galvanizing works. In that instance there was no gas main near the works, and the experiment was carried out with compressed gas. The experiment was a success. During the annealing process the edges of the plates became oxidized, and at Port Talbot endeavours were being made to combat this by using town gas during the annealing process. The big annealing pots formerly stood in the air to cool, but they were now covered with a casing, and gas was put into the outer chamber, so that they had a neutral atmosphere. In the third process, the tinning, the tin was melted and kept hot, and the rolls actually worked in the hot metal. He thought

that the heating of the tin pots was a prospective source for a large output of gas. Uniformity of temperature was the essence of the whole process. These facts certainly showed that there was an extensive field for the use of gas in the tinplate industry.

Mr. BELL, replying, said he was particularly thankful to his Chief, Mr. Madden, for the assistance he had given him in connection with that paper and other matters. There were several points in the discussion to which he desired to reply, and especially did he wish to reply to the points which Mr. Barker had made in his letter. To each of those points he proposed to reply to Mr. Barker by letter. Regarding the question of the chill of the rolls, as he understood it the difficulty was that of getting an even expansion. In his view gas was the medium which should be applied to give even heating, and that without bringing in the grave fault of producing possible fractures. Mr. Barker had stated that in his view it was unwise to put the rolls in temporary housing, and then to remove them to the frames, and he (Mr. Bell) desired to explain that that procedure was adopted when they were experimenting, for they had asked to be supplied with two old rolls for the purpose of enabling them to try what they could in the direction of meeting the requirements. He agreed with the idea that they must present a united front on all gas questions, and he believed that the present was an age which would redound to the credit of all engaged in the Gas Industry. They had to realize that there were many loads which had never been theirs but which should have been theirs, and which were now going to oil. In that connection he was told that many of the huge blocks of flats which were being put up in London were not to have any gas installed. As regards pack annealing, that had been in operation for a considerable time, and they had been told by one of the most prominent manufacturers that it was time that pack annealing was substituted by something better. He had recently had an inquiry for a huge biscuit oven which would contain some novel features, and he was working upon the idea. In conclusion he desired to thank the members for the hearing they had accorded his paper.

At the conclusion of the meeting the members adjourned to the Park Hotel, Cardiff, for luncheon, and later in the afternoon they were conveyed to the Cardiff Gas Light and Coke Company's Works, of which, at the invitation of the Chairman and the Directors, they made an inspection. The members were also entertained at tea by the Chairman and Directors of the Cardiff Gas Light and Coke Company.

After deciding that the next meeting should take place at Porthcawl on Thursday, Sept. 17, the members adjourned for luncheon at the Park Hotel, and thereafter drove to inspect the works of the Cardiff Gas Light and Coke Company, by kind invitation of the Chairman and Directors. Tea was provided after the visit.

SOCIAL EVENTS.

On the preceding day, the half-yearly golf competition took place at the Penrhys (Rhondda) links. Favoured by glorious weather, the event was most enjoyable. The choice of course was in recognition of the fact that Mr. Octavius Thomas has been President of the Rhondda Golf Club since its formation.

The morning was devoted to a medal event, the winner of the Upjohn Cup being Mr. R. R. Bird (Cardiff), who returned a net score of 73. The afternoon was devoted to a bogey competition. Details:

UPJOHN CUP.

	G.	H.	N.
R. R. Bird (Cardiff)	86	13	73
C. S. Shapley (Leeds)	98	19	79
B. Grainger (Caerphilly)	98	18	80
F. W. Richmond (London)	85	5	80
J. Sadler (Newport)	96	14	82
Lt.-Col. Planck (Birmingham)	93	11	82
H. D. Madden (Cardiff)	107	24	83
C. L. Bury (Wrexham)	101	18	83

BOGEY.

Lt.-Col. Planck	5 down
J. Sadler	5 "

In the evening, the members and their guests dined informally at the Park Hotel.

Scottish Junior Gas Association (Eastern District)

Differential Charges for Gas

Several pertinent questions relating to the Gas Industry were discussed at length at the Annual General Meeting of the Scottish Junior Gas Association (Eastern District), held in Edinburgh on Saturday, May 16. Mr. DAVID YULE, of Alloa, President of the Association, occupied the chair.

The CHAIRMAN expressed gratitude to those who had replied to the questions submitted to them by members. He was disappointed, however, that the Short Paper Competition had resulted in only two papers being submitted. Three prizes were offered, and he hoped that more enthusiasm would be displayed during the next session. Thanks were expressed to Mr. W. B. McLusky, of Halifax, and Mr. J. D. Smith, of Belfast, for acting as adjudicators in the competition; and it was announced that Mr. McLusky had presented £1 1s. towards the prizes. The First Prize was awarded to Mr. Edward Alexander, of Edinburgh, and the Second Prize to Mr. A. Morris, of St. Andrews.

Mr. A. L. DUFF (Hon. Secretary) read a letter from the Scottish District Board of the National Gas Council, intimating that they had turned down the suggestion relating to affiliation with the Scottish Branch of the National Smoke Abatement League. Mr. YULE said they had that day decided to ask the Western District of the Scottish Junior Gas Association to join with the Eastern District in a further effort to have the Seniors represented on the League Committee.

Criticism on the present education system affecting gas engineering students was made by several members, and the general feeling of the meeting was that there is real need for better standardization of the curricula and methods of the different institutes concerned.

NEW OFFICERS.

President.—Mr. D. Garrie (Burntisland).
Vice-President.—Mr. D. Warden (Dundee).
Members of Council.—Mr. R. Stewart (Auchterarder), Mr. S. Smith (Dunfermline), and Mr. P. Gourlay (Markinch).

The following office-bearers were re-elected:
Hon. Secretary and Treasurer.—Mr. A. L. Duff (Edinburgh).
Librarian.—Mr. A. Doran (Edinburgh).

The following were elected Hon. Members of the Association: Mr. D. Campbell (Kelty), Mr. Gemmell (Edinburgh), and Mr. A. C. Young (Arbroath).

DISCUSSION ON QUESTIONS.

The various questions discussed had been submitted by members some time previous to the meeting; and several leading gas engineers had been asked to give written answers. The questions related to the following subjects: Differential Charges, Gas Pressure, Unaccounted-for Gas, Valuation of Gas-Works, Showrooms, Distribution, and Gas Products.

In this "JOURNAL" we publish the reply to the first question. The others will be dealt with in later issues.

DIFFERENTIAL CHARGES.

Reply by Mr. JAMES CAMPBELL, of Dunfermline.

The question was: *There is some agitation in the Gas Industry at present for the introduction of a system of differential charges for gas, and I read that from the accountancy viewpoint the correct method is to divide the charge under four heads:*

(1) *Customer charge.*
(2) *Maximum daily demand charge.*
(3) *Maximum hourly demand charge.*
(4) *Commodity charge.*

Which costs does each of these sub-divisions cover, and how is each computed?

Could an actual example be worked out, using figures which are generally applicable?

Here is Mr. Campbell's answer:

CUSTOMER CHARGE.

This covers all expenses which are governed by the number of consumers, and includes the cost of meter reading, rendering and collection of accounts, book-keeping, repair and maintenance, and interest and sinking fund charges on meters and services, gratuitous complaint service, and general distribution charges—in fact, all charges that are not dependent upon the quantity of gas used.

DAILY AND HOURLY MAXIMUM DEMAND CHARGE.

These charges include such expenses as are dependent upon providing a distribution system of such sufficient size and capacity as will meet the required demand; and these charges will not vary with the volume of gas distributed.

The principal items will include fixed charges on the

necessary producing plant, and part of the working and maintenance costs.

Commodity Charge.

This charge covers all costs which are directly proportionate to the volume of gas produced, and includes such items as net cost of coal, works salaries, purifying, carbonizing wages, and the greater proportion of works repairs and maintenance.

I submit the accounts of the Dunfermline Corporation Gas Department for the year ended May 15, 1930, worked out so as to show allocations to "service and commodity" on the lines recommended by the National Gas Council Committee on Gas Charges; and from these it will be seen that, if every consumer had paid us a standing charge of 34s. 3d. per annum, we could have sold gas at 1s. 10·59d. per 1000 c.ft., or 5·25d. per therm.

It is, of course, hardly practicable to compel every consumer to pay such a standing charge, particularly in view of our having so many consumers whose total account does not amount to 34s. 3d., and it would therefore appear that the alternative is to frame a scale of charges on the "block" system, so designed as to carry as great a proportion as possible of these service charges on the first block, and to spread the remainder over the rest of the scale.

It so happens that in Dunfermline a new scale of charges on the block system comes into force to-day, and it may be of interest if I examine these charges in detail.

The new scale is as follows:

1. For all gas used up to 24,000 c.ft. per annum, 3s. 2d. per 1000.
2. For consumptions in excess of 24,000 and under 100,000 c.ft. per annum, 2s. 10d. per 1000 c.ft.
3. For consumptions in excess of 100,000 and under 500,000 c.ft. per annum, 2s. 2d. per 1000 c.ft.
4. For consumptions in excess of 500,000 and under 1,000,000 c.ft. per annum, 2s. 1d. per 1000 c.ft.
5. For consumptions in excess of 1,000,000 c.ft. per annum, 2s. per 1000 c.ft.

The figure of 24,000 c.ft. per annum was arrived at by taking out the average consumption of all consumers, exclusive of bulk supplies and public lighting.

An analysis of our accounts gave the following information:

7757	consumers used	103,446,000	c.ft., an average of	13,330	c.ft.
3924	,, ,,	145,672,600	,, ,,	37,136	,,
149	,, ,,	26,095,000	,, ,,	175,134	,,
11	,, ,,	6,546,700	,, ,,	595,154	,,

The majority of consumers in the third and fourth blocks formerly had special rates for industrial purposes, and in the new scale care was taken that, if possible, these should suffer little or no increase in price. On the other hand, it was apparent that we could not secure an increased rate from those small consumers using less than 24,000 c.ft. per annum. We had a certain sum of money, about £1000, which we could afford to lose, and this sum was therefore distributed among the consumers in the second block, enabling us to give them a reduction of 4d. per 1000 c.ft. on all gas used in excess of 24,000 c.ft. and under 100,000 c.ft. per annum.

These consumers are almost entirely domestic, and I believe it will be an inducement to increased consumption when it is fully realized that all consumptions beyond 24,000 c.ft. per annum will have the benefit of a reduction of 4d. per 1000.

To have given a reduction of 4d. per 1000 on a flat rate would have meant £6000 per annum, a sum which would be quite impossible; and it is important to learn that a sum that would give a reduction of only 1d. on a flat rate would give a reduction of nearly 7d. per 1000 c.ft. on the price for the second block. This I consider to be the most important point in the scheme, for two reasons:

(A) Any consumer at present using (say) 24,000 c.ft. per annum, and installing additional appliances, knows definitely that the increased consumption will be charged at 4d. per 1000 c.ft. less; and this differential rate will be secured without the Department having to bear the cost of an additional meter.

(B) In Dunfermline, we need £1500 to be able to give a reduction of 1d. on a flat rate, and a surplus of (say) £1000, or any sum not a multiple of £1500, is therefore not applied in reduction of price.

But £1000 would enable us to reduce the price of gas in the second block by 4d., and a reduction of 4d. is substantial enough to act as a real inducement. I am afraid that reductions of the order of 1d. per 1000 c.ft. are not appreciated by consumers, and have no real value in stimulating consumption.

Under our new scale, which will include slot consumers, there will be no discounts, and no industrial rates for gas, the prices charged being wholly dependent upon the quantity used. This will be of special benefit to large domestic consumers, and will obviate the difficulty of deciding whether certain users of gas are domestic or industrial.

The whole subject of charges is a most important one for the Gas Industry, and the need for being prepared is shown by the following quotation from a speech by Mr. Frank

Dunfermline Corporation Gas Department.

[Allocation of Expenditure for Year 1929-30.]

—	1929-1930 Figures.		Allocation of Two-Part System of National Gas Council.					
			Service.			Commodity.		
	£	£	P.Ct.	£	£	P.Ct.	£	£
Manufacture—								
Net cost of coal	7,139					100	7139	
Salaries	1,095					100	1095	
Purifying	155					100	155	
Carbonizing	2,247					100	2247	
Repairs to works	3,211		12½	401		87½	2810	
Boiler fuel, &c.	1,580					100	1580	
Manager's office and laboratory	341		60	204		40	137	
State insurance	265		50	132		50	133	
		16,033			737			15,296
Distribution—								
Salaries	411		90	370		10	41	
Repairs mains and services	1,241		75	931		25	310	
,, meters	1,703		100	1703				
,, cookers	1,056		100	1056				
General charges	901		75	676		25	225	
		5,312			4,736			576
Administration and collection—								
General administration	800		60	480		40	320	
Collectors and staff	993		100	993				
Stationery and printing	262		100	262				
Board of Trade and National Gas Council	128		60	77		40	51	
		2,183			1,812			371
Feu duty, taxes, and insurance	8,018	8,018	50	4009	4,009	50	4009	4,009
Sinking fund	11,640		50	5820		50	5820	
Interest	6,932		50	3466		50	3466	
Loans fund charges	117		50	59		50	58	
		18,689			9,345			9,344
Income-tax	2,849	2,849	25	712	712	75	2137	2,137
		53,084			21,351			31,733
Less miscellaneous receipts		899	50	449	449	50	450	450
		£52,185			£20,902			£31,283
					31,283			
					£52,185			

Number of consumers, 12,210; cost of service, £20,902 = 34s. 3d. per consumer per annum.
Gas sold, 332,296,000 c.ft. ∴ commodity charge = 1s. 10·59d. per 1000 c.ft. = 5·25d. per therm.

Hodges, a member of the Central Electricity Board, at a recent meeting in Glasgow:

> The stage had now been reached where it was possible for the Central Board to work out a tariff for the whole of Central Scotland, and negotiations with authorized undertakings in connection with this tariff were already far advanced.
>
> In a short time, therefore, the grid, as it applied to Central Scotland, would be complete, even to the definition of a tariff for the area. That meant that the Board and authorized undertakers deriving electricity from it would be in a position to supply electricity at an economic rate.

Mr. W. B. McLusky, of Halifax, submitted observations on the points raised in the question, and Mr. Campbell also replied to these, as follows:

CUSTOMER CHARGE.

Mr. McLUSKY: There are 24 small houses in a row using in the aggregate 240,000 c.ft. of gas per annum, which averages only 10,000 c.ft. per house per annum—a very small quantity, to be sure. There is a mill nearby using as much gas as all the houses combined. There is a church not far away using as much as four of the houses. There is a public-house using as much as six of the houses; a library using as much as four; and a picture house using as much as six of them.

Is there any reason why the price of gas should not be the same to all of these customers, and for all purposes, whether it be burned in the morning, the afternoon, during the period of maximum demand, or during the night, when most of our consumers are using no gas at all? Or should we take into account that the mill uses very little gas during certain months of the year; that the church uses gas only for an hour or two during certain days of the week; and that the picture house uses gas mainly for emergency lighting?

Mr. CAMPBELL: Theoretically a customer such as this mill should pay a "maximum demand charge," because of the incidence of its short hour load. It may require gas in large hourly amounts over only a few hours per day and a few months in the year, whereas the small houses may use gas every day in the year, and over many hours per day, thus providing a better load for the manufacturing plant. On the other hand, the small houses may cost 2s. 6d. each per annum for purely office charges, including cost of meter reading, rendering and collection of accounts, &c., so that, for the 24 houses, these charges would amount to £3 against a cost of 2s. 6d. for the mill for the same consumption.

In the case of the houses, office charges amount to 3d. per 1000 c.ft., while in the case of the mill the corresponding charge is only 0·125d.

Again, each of these 24 houses requires a service pipe and a meter, so that capital charges per 1000 c.ft. used are much greater than in the case of the mill, being 2d. and 1s. per 1000 c.ft. respectively.

It is a difficult question to say whether all these various consumers embraced in the question should pay the same price, but I strongly favour making the price dependent upon quantity used, unless in very special circumstances.

MAXIMUM DAILY AND HOURLY DEMAND CHARGE.

Mr. McLUSKY: Is the cost of delivering 1000 c.ft. of gas per quarter to a large consumer as low as the cost of delivering the same volume of gas, in the same time, to a number of small consumers? The large consumer has only one service pipe. The small consumers (for argument's sake) would have one service pipe to every individual house; one service tap; one meter tap; one meter; and one separate account to render, deliver, and collect.

Having examined the cost of providing the mains, service pipes, taps, meters, and the cost of making up and rendering of accounts, we have nothing to do but apportion these costs fairly between consumer and consumer in the form of a service charge. Then every consumer (within limits) would buy the commodity gas at the same price. Those who used gas generously would benefit; those who used gas merely as a stand-by would perhaps suffer, but they would have, at least, the satisfaction of knowing that they were not paying more than their neighbours for the same service.

Those whom we describe as small consumers (I have in mind small houses—not large houses with a boiler burner as a stand-by), who use only a small quantity of gas over a year, are the valuable customers, for they use gas at least 300 days in the year, and nearly 16 hours of the day for one purpose or another. On the other hand, some of our large customers are good customers for a season, but use very little gas at other times.

Mr. CAMPBELL: It is much less costly to supply 1000 c.ft. to a single large consumer than to supply the same quantity in the same time to a number of small consumers, principally for the same reasons as are given in the previous answer—*i.e.*, office and capital charges are much more in the case of the small consumer.

I agree that, theoretically, a "service charge" *plus* a "commodity charge" is the correct method, but it is difficult to put into practice, owing to the large number of small consumers. To make this method optional would, I am afraid, defeat our object, as it would be accepted only by those consumers who would largely benefit by it. I prefer to include as much as possible of the service charge in the first block of a scale of charges.

SPECIAL RATES.

Mr. McLUSKY: Can we justify special rates for special purposes independent of the hourly demand or volume of gas used per month or per quarter? Is there a place in our system of financial administration for a "Purpose Price?" Should we sell gas at a special price for any purpose whatever?

Mr. CAMPBELL: I would answer all these questions in the negative, unless in very special circumstances. If a consumer could be got whose use of gas was confined to (say) the hours between midnight and 5 a.m. for 6 days per week, and for every week in the year, then, I would say that for this purpose a very special price should be given. Without some such circumstance, it only leads to anomalies if we make the price dependent upon the purpose for which the gas is used, as you may have two consumers using exactly the same quantity of gas, but paying widely different prices for it.

Replying to a number of questions put to him by the members present, Mr. Campbell summed up by saying that under the suggested new charges they were trying to make everyone pay as much as possible of their share of the first block. It was the big consumers who had made it possible to give the small consumers a low rate, and finally the scales had not been drawn up as a matter of expediency, as some were inclined to think.

The South African Lighting Association, Ltd.

ANNUAL GENERAL MEETING

The Forty-Second Ordinary General Meeting of the shareholders of the South African Lighting Association, Ltd., was held in the Association's Offices at 48, Copthall Avenue, E.C. 2, on Wednesday, May 27, 1931—Mr. WM. CASH, J.P., F.C.A. (Chairman of the Association), presiding.

The SECRETARY (Mr. Wm. Cash, jun., M.A., F.C.A.) read the notice convening the meeting. The minutes of the last Ordinary General Meeting, held on May 29, 1930, were read, confirmed, and signed, and the Secretary read the Auditor's report concerning the accounts and balance-sheet.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN announced the receipt of a letter from Mr. Henry Woodall, J.P., M.Inst.C.E. (one of the Directors of the Association), apologizing for his inability to attend, due to illness, by reason of which he had been confined to bed during the Whitsun holidays. The Chairman added an expression of regret, and hoped that Mr. Woodall would soon be restored to health.

Moving the adoption of the Directors' report and the accounts and balance-sheet for the year ended Dec. 31, 1930, the Chairman called attention to the fact, stated in the first paragraph of the report, that as from April 1, 1930, the price of gas at Port Elizabeth was reduced by amounts varying from 5d. per 1000 c.ft. for private consumers to 8d. per 1000 c.ft. for large industrial consumers. All the Directors agreed, he said, that this was a move in the right direction, because it was obvious that, in order to encourage the greater use of gas, the price must be reduced as much as possible. The reduction in price was equivalent to a sum of between £720 and £730 on the quantity of gas sold during the nine months of 1930 in which the reduction had operated, so that a substantial advantage had been conferred upon the consumers by that reduction.

Notwithstanding that, however, the sales of gas during 1930 represented a decrease as compared with the sales of the previous year—the decrease at Port Elizabeth being nearly 4 p.ct., and at Grahamstown about 2½ p.ct.—and it appeared to be due to a variety of causes. Mr. Gardner Pennington (Engineer and Manager in South Africa) had expressed the view that the hot weather experienced in South Africa during 1930 had had something to do with it, and also there was no doubt whatever that there had been a reduction of consumption per consumer. The average consumption per consumer had fallen by about 1250 c.ft. per annum, and that was due, in a measure at least, to the state of trade in Port Elizabeth, where things were decidedly not good. Very careful investigations had been made in order to ascertain where the reduction had occurred, and the figures indicated that it had been, in a sense, general; but there were individual cases in which factories and workshops had either closed down or were doing less trade than formerly, so that the consumption of gas was affected directly. One satisfactory feature had emerged, however; it was that during the year 1930 the Association had connected 60 or 70 new consumers in Port Elizabeth, though that had been off-set by a reduction of about 20 at Grahamstown. The increase in the number of consumers at Port Elizabeth was satisfactory as showing that people were still prepared to take gas, notwithstanding the competition of electricity there.

WORKING RESULTS.

With regard to the working results of the undertaking, he was pleased to be able to report that the improvement un-

doubtedly had continued during 1930 and was still continuing in 1931. For example, there had been quite a substantial saving in the quantity of coal consumed for a given output of gas, and the leakage of gas at Port Elizabeth—which had always been a troublesome matter there—had been reduced by about 1¼ p.ct. Leakage at Grahamstown had increased slightly during the year, due to the fact that a lot of sewerage work had been carried out, resulting in disturbance of a number of gas service pipes. The results, expressed as sales per ton of coal carbonized, were better than in the previous year.

During the year there had been a complete overhaul of the retorts, and the retorts had been re-set. As had been proved to date, the effect of this overhaul was to improve working results still further. Mr. Pennington had been able to reduce wages costs in 1930, and the reports for the first three months of the current year showed that the reduction was continuing.

Discussing the profit and loss account, the Chairman said that, for obvious reasons, not much detail was given to show how the figures were arrived at. The balance of net revenue for the year was £8904, but for the first time there was shown, on the other side of the account, the Dominion income-tax charge (£1370). Deducting one from the other, the net result for the year was £7534. The equivalent figure for the previous year was £7664, because in the previous year the amount of the Dominion income-tax had been deducted before arriving at the profit as shown in the printed accounts. It was only fair to say that the charge for Dominion income-tax was very much larger in 1930 than in 1929, but that was a matter which, of course, the Board could not control. Dominion income-tax was assessed—in the same way as income-tax in this country—on the results of the preceding year, so that the charge for Dominion income-tax in 1929 was only about £250, because it was based on the profits of 1928, which was a bad year, and the charge for 1930 was based upon the bigger profits of 1929. All businesses carried on abroad had to face the disability of paying tax both in the country of operation and in this country. On the other hand, it was only fair to point out that there was some relief in this country by reason of the Dominion income-tax paid by the Association in South Africa, and, accordingly, the dividends in this country suffered a reduction of only 3s. 4½d. in the £ in respect of English income-tax. Comparing the profits of the Association in 1929 with those of 1930, however, without making an adjustment in respect of Dominion income-tax, the profits of 1930 were the better.

A Policy of Caution.

The dividend which the Directors recommended in respect of 1930 had been fully earned, and it was proposed also to add £1236 to the amount of £5431 brought forward from 1929, thus carrying forward to 1931 the total of £6667. It was quite obvious that, on the 1930 results, the Association could have paid a dividend of 6 p.ct. instead of the proposed 5 p.ct.—the 1 p.ct. difference representing £900. If the outlook for trade in Port Elizabeth had been better than in fact it was, he believed the Directors would have recommended a dividend of 6 p.ct. instead of the 5 p.ct. (which had been paid during the previous two years). Having regard to the difficulties of the position, however, they had exercised caution, and had felt that it would be wise to retain the money which would be absorbed if the extra 1 p.ct. dividend were paid. It had also to be borne in mind that there was to be a readjustment and some reduction of the charges for electricity in Port Elizabeth this year, and when the Directors of the Association knew a little more about that it might be wise to make a further reduction in the price of gas, in order to help consumption. Of course, if people were not likely to increase the use of gas there was not very much point in reducing the price.

So far as 1931 was concerned, it was of no use pretending that the results so far were better than in 1930. The figures available covered only the first three months of the year, and that was a short period upon which to base a judgment, but there had been no increase in the quantity sold, though there was an improvement in working costs. In Port Elizabeth, trade remained bad; Grahamstown was rather a different class of town, in that it was less dependent upon trade, but there also one saw little indication of advance—indeed, rather the reverse was indicated.

The Chairman also referred to the fact that as from Jan. 1, 1931, the mortgage debenture issue had been re-arranged, £25,000 of 8 p.ct. debentures having fallen due for repayment on that date. The Association had agreed to give the holders, in exchange, 6½ p.ct. debentures at a small discount, and at the same time to enlarge the issue from £25,000 to £30,000—power to do so having been given already by a resolution of the shareholders. As a result, there would be rather more cash available than at present as working capital. As was shown by the balance-sheet, the transaction was in course of being carried out at Dec. 31, 1930. Money had been received in advance on account of subscriptions to the new issue. If the new issue were made at (say) £95 p.ct., the new money which would be received as the result of enlarging the issue by £5000 would be about £3500, and there was required to be repaid to those who required to be repaid the difference of £3794, which for the moment was in cash at the London bankers, as part of the balance of £6069 mentioned in the balance-sheet. It might be that next year, if the Association could afford it, they would write off that discount on debentures. That might be another reason for carrying forward from 1930 rather more than would otherwise have been carried forward.

Renewal Fund.

With regard to the renewal fund, it would be noted that the Auditor, Mr. Percival Griffiths—who looked after the interests of the shareholders very well—had certified the balance-sheet "Subject to the adequacy of the renewal fund." It would not be an injustice to Mr. Griffiths to point out that he did not express the opinion that the fund was inadequate. The opinion of the Directors, said the Chairman, was that the fund was quite adequate. They had a system by which there was added to the fund each year a calculated sum based on the quantity of coal put into the retorts. The fund had been reduced from £3837 at the end of 1929 to £2359 at the end of 1930, to meet the cost of the overhaul of the retorts which had been effected in 1930, but if the business were maintained at about the present level the retorts would serve for another five or six years without further overhaul, and at the end of that period the fund would be sufficient to do the work again, and there would still be a balance of more than the present figure of £2359.

The only other part of the plant, apart from the retorts, which called for special or extraordinary renewals expenditure were the gasholders. As he had stated last year, all the three holders had been completely overhauled, and they were in first-class order, so that for some time there would be no special expenditure in that direction. Like all other gas undertakings, the Association retained the remainder of the works and plant—including mains, meters, and so forth—out of revenue year by year, so that in that sense it might be thought that a renewal fund was unnecessary. But the fund was created because the overhaul of retorts and holders situated at a distance from this country was expensive, and the Directors believed that that fund was sufficient to meet the cost of renewals of the character he had mentioned.

The capacity of the works was such that they could produce very much more gas than was being sold at present. The amount expended on capital account at Port Elizabeth was only £865 in 1930, and more than £500 of that was expended on the purchase of a piece of land situated between the two works there. This land had been a road or by-road, but the town authorities had closed it, and the Association had acquired it, so that the two works were enclosed on one piece of land belonging wholly to the Association. The remainder of the capital expenditure at Port Elizabeth was in respect of mains. At Grahamstown there had been no expenditure on capital account during the year.

The book value of the reserve fund investments was £6786, but their market value was about £800 more. They were all first-class securities, the values of which had increased—a pleasing feature in these days, when most people were deploring the shrinkage of the capital value of their investments.

A Difficult Year.

In conclusion, the Chairman said that the Association's staff in South Africa had had a difficult and trying time, but they had done their best during the past year, and on the whole the results were not unsatisfactory, although, of course, the shareholders would like to see signs of expansion in the business, rather than to see it standing still or even showing some small diminution. It was hoped that the business would expand before long and that rates of dividend could be increased; meanwhile, the Association would continue to pay a moderate remuneration to capital.

Mr. T. N. G. Jennings (Director) seconded the resolution for the adoption of the report and accounts.

In response to the Chairman's invitation to the shareholders to discuss the report and accounts,

Mr. F. R. Smith asked whether the Directors considered that the reduction in the quantity of gas sold was due chiefly to bad trade or to electricity competition.

The Chairman said he believed it was due to a combination of both causes. He had no doubt that electricity was affecting the gas sales. A feature which, in one sense, was pleasing was that the bad trade was reflected in the reduced consumption *per consumer;* it was not that the people were changing from gas to electricity, but that they were actually burning less gas. An important factor was that some factories, which had consumed large quantities of gas, had closed down as the result of bad trade.

The resolution for the adoption of the report and accounts was then put to the meeting and carried unanimously.

Dividend.

The Chairman proposed the declaration of a dividend of 5 p.ct. for the year 1930, subject to income-tax of 3s. 4½d. in the £.

Mr. Jesse F. Scott, A.M.Inst.C.E. (Director), seconding, congratulated the shareholders on the fact that the proposed dividend had been more than earned. As the Chairman had explained, he said, it was usual to be moderate in the distribution of dividends in the present circumstances, because it was well to have available a fair amount of liquid cash. The past year, he added, had been rather a trying one. He received letters and reports weekly from Mr. Pennington, who referred frequently to the trade depression in South Africa, and it could be accepted that the trade depression in Port Elizabeth was more severe than in this country. The Association had lost some of its large consumers of gas as the result of the depression, and the ordinary consumers had been very economical in their use of gas. Referring to the overhaul of the carbonizing plant, he said that a skilled man from England had spent some months at the works, so that the plant was in a thoroughly satisfactory condition; in consequence, more gas was made per ton of coal and per retort, and labour costs were decreasing. It was difficult to forecast what might happen this year; but, though there might be a slight decrease of output, he felt sure that the profits would not suffer very much, be-

cause the tendency was all in the direction of more efficient working and the better arrangement of labour.

The CHAIRMAN emphasized that Mr. Scott—who gave to the Board all the benefit of his experience as a gas engineer—wrote to Mr. Pennington and received reports from him weekly, so that the Board knew well all that was going on from time to time.

The resolution concerning dividend was carried unanimously.

RE-ELECTION OF RETIRING DIRECTOR.

The Director who retired by rotation was Mr. William Cash (the Chairman).

Mr. T. N. G. JENNINGS, proposing the re-election of Mr. Cash, said that his long experience with gas undertakings in this country, his long connection with the Association, and his thorough grip of its business pre-eminently qualified him for his position as Chairman.

Mr. JESSE F. SCOTT, who seconded, also referred to Mr. Cash's valuable services to the Gas Industry in general and to the Association in particular.

The resolution was carried unanimously.

The CHAIRMAN, returning thanks for his re-election, said that he had been connected with the Association, either personally or through his father, since its inception—and this annual meeting was the forty-second. He would like to see it making more rapid progress, but he pointed out that it had had to face exceptional difficulties. Incidentally, he mentioned that the Directors still felt that in existing circumstances they ought not to draw the full fees to which they were entitled. This year, as in the previous year, £500 was divided between the four Directors, representing two-thirds of the amount voted by the Shareholders. They might revert to the higher figure, however, when they felt that the Association could afford it.

RE-ELECTION OF AUDITOR.

On the motion of Mr. R. LONG, seconded by Mr. F. R. SMITH, Mr. Percival D. Griffiths, F.C.A., was re-elected Auditor for the ensuing year, at the usual fee of 40 guineas.

VOTE OF THANKS TO THE STAFF.

The CHAIRMAN proposed a hearty vote of thanks to the officers and workmen in South Africa, and asked that a shareholder would associate himself with it as seconder, in order that the staff might be assured that appreciation of their services were shared both by the Board and by the general body of shareholders. Mr. Pennington, he said, had had a difficult time, but he had worked tremendously hard and had produced very much improved results. He had reduced labour and all other charges, without sacrificing efficiency. Last year the Association had done rather better in regard to coke than in the previous year; it had not done so well on tar, but the quantities and the general working results had undoubtedly been good. It must be remembered also that Mr. Pennington had to deal with a Colonial coal, which was not so good as English coal. He had the interests of the Association very much at heart, as was shown by his letters. The Chairman also paid a tribute to Mr. E. M. Sterley (the Secretary) at Port Elizabeth, and Mr. Hart, of Grahamstown, both of whom had served the Association well for a great many years.

The vote of thanks was seconded by Mr. F. R. SMITH, and carried unanimously.

VOTE OF THANKS TO CHAIRMAN AND DIRECTORS.

Mr. F. R. SMITH proposed a very hearty vote of thanks to the Chairman and Directors, and commented upon the fact that not only had they been able to present a very favourable balance-sheet, but had sacrificed part of their fees. He also expressed thanks to the Association's very able Secretary in London (Mr. Wm. Cash, Jnr.) and his staff.

The vote of thanks was seconded by Mr. WILLIAM ARNOTT, and carried with acclamation.

The CHAIRMAN, in the course of a brief response, said that he and his fellow Directors appreciated very highly the vote of thanks accorded them, and expressed the hope that next year they would be able to present still more satisfactory results.

The meeting then closed.

The Hong Kong and China Gas Company, Ltd.

The Annual General Meeting of the Shareholders was held at the Company's Offices, 148, Gresham House, Old Broad Street, E.C., on Thursday, 28th May, 1931—Mr. ROBERT H. GLEN, F.C.A., Chairman, presiding.

The SECRETARY (Mr. A. C. Pullen) read the notice convening the Meeting and the Auditors' Report.

The CHAIRMAN: Gentlemen, Copies of the Report and Statement of Accounts having been sent to all the Shareholders, I will ask you to take them as read.

My first duty is to refer to the decease of Mr. Strachan C. Clarke, who was appointed a Director in 1916. Mr. Clarke had been ill for some time, but we had hoped for his complete recovery. Unfortunately, however, his condition became more serious and he passed away in October last. The Board have elected Mr. H. Royston Askew, A.M.I.C.E., to fill the vacancy.

The Company's financial operations have been seriously affected by the fall in value of the Dollar. The following are the rates during the past twelve years on which the local Accounts have been based.

1919	4/1d. per	Dollar	1925	2/3¾d. per	Dollar
1920	4/4d. ,,	,,	1926	2/2½d. ,,	,,
1921	2/7½d. ,,	,,	1927	1/11⅝d. ,,	,,
1922	2/6d. ,,	,,	1928	2/0¼d. ,,	,,
1923	2/3⅜d. ,,	,,	1929	1/10¾d. ,,	,,
1924	2/4½d. ,,	,,	1930	1/4 7/8d. ,,	,,

The rate of Exchange on 31st December last was 1/1d. and has since been down to about 11d., but to-day the dollar stands at 11½d. Many difficulties, which time does not permit to fully explain, have been created by the abnormal position, in addition to which business at the Colony has been affected.

In endeavouring to meet the situation, the Board increased the price of gas on 1st May, 1930 from $2·50 to $3, on 1st January, 1931 to $3·30 and on 1st Instant a further increase to $4 came into operation. Until last year, our price had not fluctuated from $2·50 since the year 1919.

At our last Meeting, I alluded to the unfortunate decline in gas sales and mentioned that the Colony had suffered from shortage of water. Happily, the Government Scheme for bringing water from the Shing Mun River and from Reservoirs at Kowloon across the Harbour by the Pipe Line, completed early in 1930, has proved successful. In spite of adverse conditions, we regained 7 millions at Hong Kong and also increased the sales at Kowloon by 12 million cubic feet.

About this time last year, we commenced negotiations with the Government for renewing the Public Lighting Contract and I am glad to say that a fresh Agreement has been signed for a five year period dating from 1st July, 1930. We have striven hard over many years in this matter of Public Lighting in the face of various difficulties and we can, I think, congratulate ourselves on the reciprocity shown by the Authorities. We are always endeavouring to have the standard of efficiency improved in this important Department. The number of Street Lamps lighted by gas at 31st December was 2,465, an increase of 56 and the new Contract is based on about 2,500.

Our sales at Kowloon amounted to 66 million, as compared with 57 million in 1927 (3 years ago). The capacity of our Kowloon Works and the possibilities for gas on that side are problems always before us, as further heavy Capital expenditure may be necessary on the Works and District there.

On reference to the Accounts, the Additions to Land, Works and Plant Account are shown as £4,087, practically all being for Mains and Services.

In the Revenue Account, Coal Carbonised is $220,106, as compared with $211,717, the quantity used being 572 tons less. But I ought to mention that we are just now paying 50 per cent. more per ton in dollars for Coal than at this time last year, (through Exchange) and we must not be surprised if the dollar cost of Coal in 1931 greatly increased. The question of Coal supplies is always under anxious consideration.

The charge for C.W. Gas was more. The Coke used for same was priced at a much less rate per ton, but the quantity of Water Gas supplied increased by 17 million.

Working Expenses are higher, one of the principal reasons being that since 1st January, 1930, we have paid the European Staff at current rate of Exchange, instead of at 1/10d. per dollar.

Maintenance of Retorts is much lower, but we reset No. 2 Verticals at Hong Kong in 1929. Maintenance of Mains and Works, taken together, are about the same as before.

The Accounts grouped under "Fittings Repairs" show an increase. A considerable number of old Cookers in stock were reconditioned and most of same are again out on Hire and earning revenue. Wages charged in connection with "Appliances Loaned" were much increased and debits are shown for ordinary Gas Fitting work at both Hong Kong and Kowloon.

The cost of Publicity was rather less, due to certain economies made.

Interest Account is much more, a heavy Bank Overdraft was carried locally during 1930.

Depreciation of Meters, Stoves, etc., appears considerably higher, but in sterling is about the same. We write 10 per cent. off sterling value in London Books of the Meters and Stoves on Hire.

On the credit side, Gas Rentals were more, due to higher dollar price and increased sales.

Meters and Fittings Rentals were about the same.

Residuals again show a decrease, considerably more Coke was sold, but price was reduced.

In the Net Revenue Account, we have again charged an amount for scrapping Obsolete Stock. The question of placing the Stocks on a sound basis has taken up much time and thought.

Income Tax Account shows a credit, due to deductions of Tax from Dividends paid.

In the General Balance Sheet, there is an Account of £6,572 for Stock Suspense Exchange. All the balances in local Books

are valued at the rate ruling on the last day of the year, which is quite proper as regards Cash, Coal, Debts due to Company, Creditors, etc., etc. But we consider, in dealing with Stocks on Works in these abnormal times, the difference arising through writing such Stocks down to so low a rate as 1/1d. should be held in Suspense. The Provident Fund for Local Staff has been dealt with in a similar manner.

I think further comments on the Accounts are not necessary, but shall be pleased to answer any questions you may desire to put to me thereon. The Balance of Net Revenue is £38,051 and we recommend a Dividend for the year at the rate of 5 per cent. per annum, less Income Tax. This was actually paid as an Interim Dividend on 17th October last.

The Board much regret that, on this occasion, they are unable to propose to you a further Dividend. The dollar balance was about the same as in 1929, but when transferred into Sterling, the difference through the fall in Exchange was such that a final dividend is really not possible. I have referred to the difficulties caused by the extraordinary depreciation in value of the dollar and it is impossible to forecast what the Exchange problem may mean to us in the near future. A Currency Commission has been sent out to Hong Kong by the British Government and the dollar may be stabilised in value. Should this be arranged, the Company's position would be more advantageous and business generally would be facilitated.

At the end of last year, I visited Hong Kong in order to study on the spot the many problems which at this time confront the Company, particularly our Kowloon Works. I was favourably impressed with the way our business is being looked after and feel that the prospects generally are quite good when Exchange is on a more satisfactory basis.

With these remarks, I have pleasure in moving that the Report and Accounts be received and adopted.

Mr. ALEX. A. JOHNSTON seconded the Resolution and, after some discussion in which it was mentioned that the Company, like so many other enterprises, was suffering at the present juncture and that the question of exchange was quite beyond control, the motion was carried unanimously.

The CHAIRMAN then moved the following Resolution:—

> "That a Dividend at the rate of Five per cent. per annum, less Income Tax be declared for the year ended 31st December, 1930, this having been already paid as an Interim Dividend on 17th October last,"

which was seconded by Major HERIOT R. GLEN and unanimously carried.

The re-election of Mr. Robert H. Glen as a Director was proposed by Mr. ALEX. A. JOHNSTON, who remarked that Mr. Glen proved a very able Chairman and Director of the Company. Mr. H. ROYSTON ASKEW seconded the motion which was unanimously carried.

Mr. R. M. LONG proposed the re-election of Messrs. Cash, Stone & Co. as Auditors for the ensuing year at their usual fee, which was seconded by Mr. ALEX. A. JOHNSTON and carried unanimously.

The CHAIRMAN proposed a vote of thanks to the Staff in Hong Kong and London, which was seconded by Mr. R. M. LONG and unanimously carried. Mr. Long proceeded to move a vote of thanks to the Chairman and Directors, which was carried by acclamation and the proceedings then terminated.

Trade Notes.

Famous Men and Carron Works.

The latest pamphlet on "Famous Men and Carron Works," published by the Carron Company, of Carron, Falkirk, deals with the life and work of V. William Symington, who was the constructor of the engines for the first steamship in Great Britain.

A Change of Address.

The Pulsometer Engineering Company, Ltd., of Nine Elms Iron Works, Reading, inform us that on and after June 1 the address of their London Office is 39, Victoria Street, S.W. 1. Telephone, Victoria 4565; telegrams, "Pulsometer Parl, London."

A Technical Data Pocket Book.

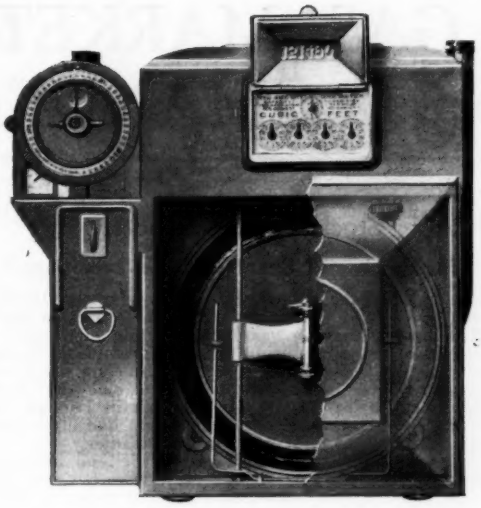
Messrs. Bernard Holland & Co., of 17, Victoria Street, S.W. 1, have published a useful little pocket book containing technical data on a number of products supplied by the firm—for example, locomotives, rotary compressors, vacuum pumps, Diesel engines, &c.

Jeffrey Portable Equipment.

A new catalogue issued by British Jeffrey-Diamond, Ltd., of Stennard Works, Wakefield, contains all the latest information relative to Jeffrey portable equipment for handling coal, coke, cinders, sand, gravel, stone, fertilizer, &c. The publication describes and illustrates, with full specifications, the design and construction of various units, drawing attention to the distinctive features of each.

Gas-Works Plant.

Messrs. Ashmore, Benson, Pease, & Co., Ltd., are issuing a new gas-works plant booklet, which will be of interest to gas engineers and managers. Among the illustrations of recent contracts executed are photographs of the waterless (Klönne Patent) gasholder supplied for the York Gas Company, the first of this type to be erected in this country, which is now in commission. The booklet also includes diagrams of a special mechanical gas producer fitted with revolving grate and possessing the feature of gasifying coke breeze, coke screenings, and other low-grade fuels.



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GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The Stock Exchange opened after the holidays last week in a depressed mood, and the volume of business was on the lean side. The gilt-edged group was practically the only one to show any liveliness; War Fives being the most prominent, closing on Friday at 102⅞. The possibility of a moratorium for Germany in connection with reparation payments and the Austrian banking difficulties caused a sharp set-back in Foreign Bonds; but by the end of the week the atmosphere had cleared somewhat, and the tone in most markets was steadier.

The conditions affecting other sections had no influence on Gas stocks and shares, and, though there were few increases in value, the general tone was firm. Among those to improve, South Shields consolidated headed the list with a sharp rise of 4 points at the local Exchange to 111-113, and, having regard to all the circumstances, some further appreciation is justified. The continual growth of the Company's business was revealed by the accounts for last year, when, in spite of the weather conditions which adversely affected the gas sales of so many other companies, the Directors were able to report an increase in output of nearly 2½ p.ct. A dividend of 8½ p.ct. per annum has been distributed since 1921, and the yield on this basis at the current price works out at £7 11s. 9d., which is high for a security of this class. The issue, however, is a comparatively small one, and, like many other gas stocks, not easily obtainable, so that a standing order with a broker will probably be necessary in order to effect a purchase.

Two other stocks to show improvement were Newcastle 3½ p.ct. debenture with a gain of 2 points to 69½-70½ at the local Exchange, and South Metropolitan 6 p.ct. preference, which hardened 1 point to 113-116. On the other hand, falls in value occurred in Imperial Continental by 5 points to 325-345, and European by 2½ points to 85-95.

The accounts of the Malta and Mediterranean Gas Company, Ltd., for the year to March 31 show an available balance of £26,799, against £25,596. The Directors propose the payment of a final dividend on the ordinary shares of 5 p.ct. (free of income-tax), making 10 p.ct. (free of income-tax) for the year (the same), leaving £21,322, against £20,119, to be carried forward.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 1.

In the London tar products market pitch is firm at 45s. per ton f.o.b.

Creosote, for export, varies from 4d. to 5d. per gallon f.o.b., according to the specification required.

Tar spirits are steady, pure toluole being 1s. 10d. to 1s. 11d. per gallon; pure benzole, 1s. 5d. to 1s. 6d. per gallon; 95/160 solvent naphtha, 1s. 4d. to 1s. 5d.; and pyridine bases about 3s. 3d. per gallon, in bulk *ex* sellers' works.

Tar Products in the Provinces.

June 1.

The average prices of gas-works products during the week were: Gas-works tar, 17s. 6d. to 21s. 6d. Pitch—East Coast, 42s. 6d. to 43s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 42s. 6d. to 43s. f.o.b.* Toluole, naked, North, 1s. 7¼d. to 1s. 7¾d. Coal-tar crude naphtha, in bulk, North, 5¾d. to 6¼d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 11d. to 1s. Creosote, in bulk, North, liquid and salty, 3½d. to 3¾d.; low gravity, 1¼d.; Scotland, 3¼d. to 3½d. Heavy oils, in bulk, North, 5⅞d. to 5⅞d. Carbolic acid, 60's, 1s. 1d. to 1s. 2d. Naphthalene, £10 to £12. Salts, £3 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *May* 30.

No great change can be reported in market conditions here, although there is a steadier tendency.

Pitch.—Current quotations are about 37s. 6d. per ton f.o.b. Glasgow for export, and about 37s. 6d. per ton *ex* works for home trade, both in bulk.

Refined tar to Ministry of Transport Specification is leaving the works in large quantities at from 2⅜d. to 2⅝d. per gallon f.o.r. in buyers' packages.

Creosote.—Owing to reduced production there is a continued demand for available supplies of the best qualities. B.E.S.A. Specification is 2⅝d. to 3d. per gallon; low gravity, 3½d. to 3¾d. per gallon; and neutral oil, 3¼d. to 3½d. per gallon—all *ex* makers' works.

Cresylic.—Quotations are higher in anticipation of an improved demand. Pale, 97/99 p.ct., is 1s. 3d. to 1s. 4d. per gallon; dark, 97/99 p.ct., 1s. 2d. to 1s. 3d. per gallon; and pale, 99/100 p.ct., 1s. 5d. to 1s. 6d. per gallon—all f.o.r.

Crude naphtha.—Value remains steady at 4¼d. to 4⅜d. per gallon *ex* works in bulk.

Solvent naphtha.—90/160 is now quoted at 1s. 3d. to 1s. 4d. per gallon, and 90/190 at about 1s. 1d. per gallon.

Motor benzole.—Supplies are limited, and the value may be taken at 1s. 3d. to 1s. 4d. per gallon in bulk.

Pyridines remain quiet. 90/160 is 3s. to 3s. 3d. per gallon, and 90/140 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole:

	s.	d.		s.	d.	
Crude benzole	0	6½	to	0	7½	per gallon at works
Motor ,,	1	1	,,	1	2	,, ,, ,,
Pure ,,	1	5	,,	1	6	,, ,, ,,

New Capital Issues.

Haslemere and District Gas Company.—As will be seen from our advertisement columns, Messrs. A. & W. Richards are offering for sale by tender, on behalf of the Directors of the Haslemere and District Gas Company, an issue of £7000 6 p.ct. redeemable preference stock, to be redeemed at par on April 1, 1945, at a minimum price of issue of par. Tenders must be received not later than 11 a.m. on Thursday, June 11.

Contracts Advertised To-Day.

Coal.

The Nantwich Gas Department invite tenders for the supply of coal. [Advert. on p. 638.]

The Mansfield Corporation Gas Committee invite tenders for coal. [Advert. on p. 638.]

The Silsden Urban District Council invite tenders for the supply of gas coal. [Advert. on p. 638.]

Gas Test Holder.

The County Borough of Cork invite tenders for the supply of a standard gas test holder. [Advert. on p. 638.]

Lime.

The Mansfield Corporation Gas Committee invite tenders for lime. [Advert. on p. 638.]

Sulphuric Acid.

Tenders are invited by the Mansfield Corporation Gas Committee for the supply of sulphuric acid. [Advert. on p. 638.]

Tar and Ammoniacal Liquor.

The Bingley Gas Department invite tenders for the purchase of their surplus tar and ammoniacal liquor. [Advert. on p. 638.]

The Mansfield Corporation Gas Committee invite tenders for the purchase of surplus tar produced at their works. [Advert. on p. 638.]

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. May 29.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. ...	77—82	...	...
522,992	,,	,,	4	4	Do. 4 p.c. Pref. ...	75—80	...	...
1,551,868	,,	Apl. 9	7⅞	7⅞	Alliance & Dublin Ord. ...	100—105	...	104
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. ...	71—76	...	...
522,655	,,	Mar. 5	7	7	Barnet Ord. 7 p.c.	124—129	...	...
300,000	1	Apl. 23	1/4⅛	1/9⅜	Bombay, Ltd.	16/6—18/6	...	17/9
174,500	10	Mar. 5	9	9	Bournemouth 5 p.c. ...	15—16	...	...
500,050	10	,,	7	7	Do. B 7 p.c. ...	12⅝—13¼	...	...
439,160	10	,,	6	6	Do. Pref. 6 p.c. ...	11¼—11¾	...	...
50,000	Stk.	Dec. 18	3	3	Do. 3 p.c. Deb. ...	60—63	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	81—84	...	...
357,900	,,	Mar. 19	7½	7½	Brighton & Hove 6 p.c. Con.	112—117	...	...
371,880	,,	,,	6¾	6¾	Do. 5 p.c. Con.	104—107	...	...
1,287,500	,,	Feb. 19	5	5	Bristol 5 p.c. max.	95—96[a]	...	...
120,420	,,	Dec. 18	4	4	Do. 1st 4 p.c. Deb. ...	78—80[a]	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	78—80[a]	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	99½—100½[a]	...	...
855,000	,,	Apl. 9	7	8	British Ord.	110—115	...	113½—114½
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	74—77	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	92—97	...	...
160,000	,,	Jan. 8	5	5	Cambridge 5 p.c. Deb. ...	95—98	...	...
100,000	10	May 21	6	8	Cape Town, Ltd.	9—10[+]	...	9⅜—9⅞
100,000	10	May 7	4½	4½	Do. 4½ p.c. Pref. ...	6½—7½	...	...
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb. ...	72—77	...	...
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord.	96—99	...	...
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb. ...	97—100	...	...
157,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord.	85—90[b]	...	...
98,936	1	May 7	†2/-	†2/-	Colombo, Ltd. Ord.... ...	28/—33/-	...	...
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	17/6—19/6	...	...
609,204	1	Apl. 9	1/4½	15·27[d]	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	...
296,053	1	,,	1/7½	17·67[d]	Do. 8 p.c. Pref.	17/6—19/6	...	...
2,073,280	Stk.	Feb. 19	6	6	Commercial Ord.	93—96	...	94—94½
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb. ...	57—60	...	...
787,560	,,	Feb. 19	7	7	Croydon sliding scale ...	108—111	...	...
453,100	,,	,,	5	5	Do. max. div.	82—85	...	...
542,270	,,	Mar. 5	7	10	Derby Con.	120—123[c]	...	...
55,000	,,	Dec. 18	4	4	Do. Deb.	65—70[c]	...	...
209,000	,,	Mar. 5	5	5	East Hull Ord. 5 p.c. ...	72—75	...	...
1,002,180	,,	Mar. 19	†4	†6½	European, Ltd.	85—95	−2½	88—88⅝
18,953,033	,,	Feb. 19	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	18/6—19/6[f]	...	19/—19/4½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	64—67	...	65—66
4,294,691	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	78—81	...	80⅛
5,694,095	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb. ...	61—64	...	62½—63½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	101—104	...	...
2,500,000	,,	—	—	—	Do. 4½ p.c. Red. Deb. ...	95½—97½	...	96½—97½
161,480	,,	Mar. 5	10	10	Harrogate Cons. 10 p.c. max.	158—163	...	...
82,500	,,	Mar. 19	7	7	Hastings & St. L. 5 p.c. Conv.	98—103	...	...
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	82—85	...	85
70,000	10	Oct. 9	⅝	10	Hongkong & China, Ltd. ...	13—14	...	13⅛—13⅜
213,200	Stk.	Mar. 5	6	6	Hornsey Con. 3½ p.c. ...	91—94	...	93
2,800,000	,,	May 21	15	25	Imperial Continental Cap.	325—345[*]	−5	325—343
223,130	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	78—83	...	79⅛—80½
235,242	,,	Mar. 5	8½	8½	Lea Bridge 5 p.c. Ord. ...	127—130	...	...
2,145,907	,,	Feb. 19	6	6	Liverpool 5 p.c. Ord. ...	99½—100½[b]	...	...
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	98½—100½[b]	...	...
165,736	,,	Feb. 19	9	9	Maidstone 5 p.c. Cap. ...	128—133	...	...
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb. ...	54—57	...	...
75,000	5	Dec. 4	†10	†10	Malta & Mediterranean ... Metropolitan (of Melbourne)	6—6½	...	...
392,000	—	Apl. 2	5½	5½	5½ p.c. Red. Deb.	86—89	...	...
675,000	Stk.	May 21	†6	†6	Montevideo, Ltd.	90—100[*]	...	...
2,061,315	,,	Mar. 5	5	5⅔	Newcastle & Gateshead Con.	16/3—16/9[d,f]	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	74—75[d]	...	...
691,705	,,	Jan. 8	3½	3½	Do. 3½ p.c. Deb. ...	69½—70½[d]	+2	...
277,285	,,	May 7	5	5	Do. 5 p.c. Red. Deb.	98—100[d]	...	...
199,940	,,	Mar. 5	7½	7½	North Middlesex 6 p.c. Con.	115—120	...	...
396,160	,,	Feb. 5	5	5	Northampton 5 p.c. max. ...	74—79	...	...
300,000	,,	Apl. 23	9	7	Oriental, Ltd.	100—105	...	...
69,000	5	13 May, '15	—	—	Ottoman	0—½	...	...
205,162	Stk.	Dec. 18	8	8	Plym'th & Stonehouse 5 p.c.	110—115	...	...
424,416	,,	Feb. 19	8	8	Portsm'th Con.Stk. 4 p.c.Std.	122—127	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	78—81	...	...
686,312	,,	Jan. 22	4	4	Primitiva 4 p.c. Rd. Db. 1911	85—88	...	...
389,813	,,	Dec. 18	4	4	Do. 4 p.c. Cons. Deb.	85—88	...	86—86½
150,000	10	Apl. 9	6	6	San Paulo 6 p.c. Pref. ...	8—8½	...	8⅛—8⅛
1,736,968	Stk.	Mar. 19	6½	6½	Sheffield Cons.	105—107[e]	...	...
95,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	79—81[e]	...	...
90,000	10	June 5	†4	‡5	South African	4—6	...	...
6,709,895	Stk.	Feb. 5	5	7½	South Met. Ord.	102½—104½	...	103—103½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	113—116	+1	114—115
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb. ...	60—63	...	63
734,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red. Db.	98—100	...	...
1,000,000	,,	Jan. 22	—	4	Do. 5 p.c. Red. Deb.	100—103	...	...
91,500	,,	Mar. 5	8½	8½	South Shields Con.	111—113[d]	+4	...
1,543,795	,,	Feb. 19	6½	6½	South Suburban Ord. 5 p.c.	102—105	...	...
668,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	101—104	...	102½
647,740	,,	Feb. 19	5	5	Southampt'n Ord. 5 p.c. max.	77—80	...	79—79⅞
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75—78	...	...
179,014	,,	Mar. 5	8	8	Sutton Ord.	120—130	...	...
94,500	,,	Jan. 8	5	5	Do. 5 p.c. Deb.	96—99	...	...
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. ...	96—99	...	...
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb.	100—103	...	...
1,076,490	,,	Mar. 5	6⅝	6⅝	Tottenham District Ord. ...	102—106	...	104—105
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	101—104	...	...
199,005	,,	Dec. 18	4	4	Do. 4 p.c. Deb. ...	77—80	...	...
85,701	,,	Mar. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	74—79	...	...
310,694	,,	Mar. 5	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	102—107	...	...
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	88—93	...	...
1,322,220	,,	Mar. 5	7	7	Wandsworth, Wimbledon, and Epsom Cons. ...	113—116	...	...
426,000	,,	,,	5	5	Do. 5 p.c. Pref.	97—100	...	98½
1,013,464	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	100—103	...	101½—102

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. ½ Div. = 10 p.ct. p.a. less tax and less tax on interim dividend.

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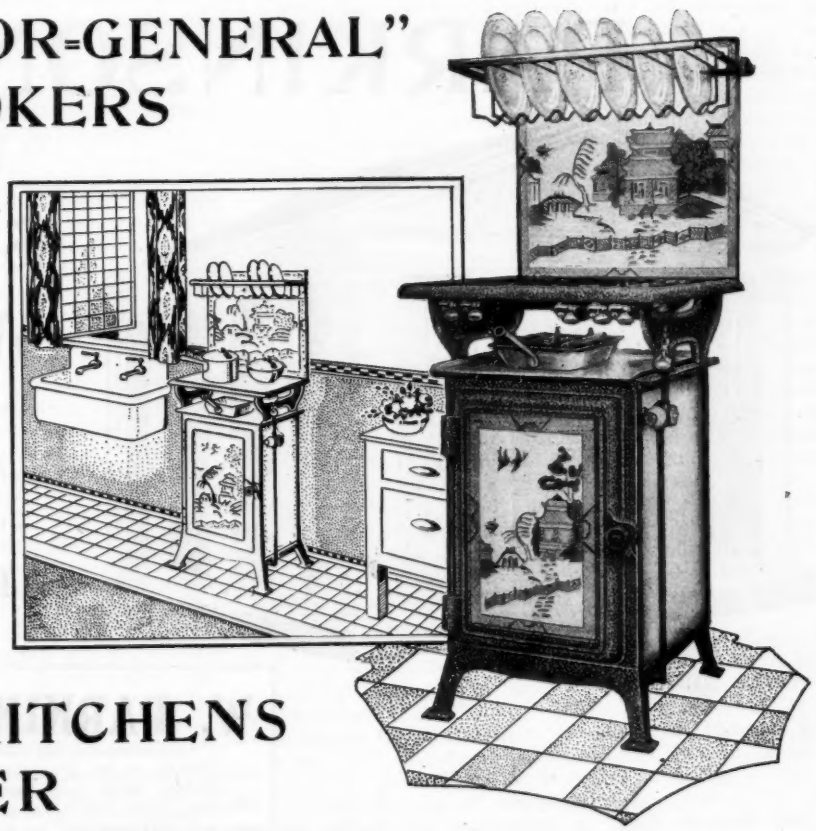

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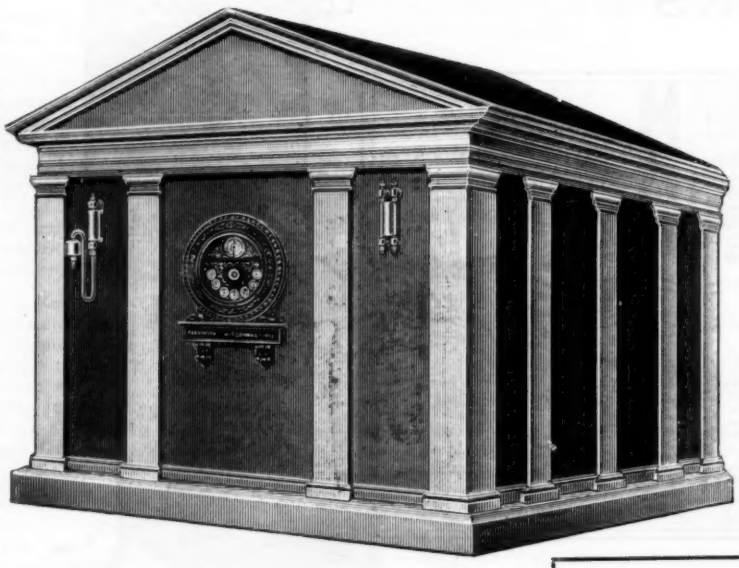

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